

527 Plymouth Road, Suite 406
Plymouth Meeting, PA 19462
Telephone (610) 834-0490
Fax (610) 834-1469

Trial Burn Plan for Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6

BASF Corporation

Geismar, Louisiana

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Section 1

Introduction

This Trial Burn Plan is being submitted by BASF Corporation (BASF) for three hazardous waste-fired boilers located at BASF's Geismar, Louisiana, facility. The boilers, identified as Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6, are subject to the Resource Conservation and Recovery Act (RCRA) Boiler and Industrial Furnace (BIF) standards codified in Title 40 Code of Federal Regulations (CFR) Part 266 Subpart H and Louisiana Code (LAC) Title 33, Part V, Subpart 1, Chapter 30.

In accordance with 40 CFR § 270.66 and LAC 33:V.535.D, this Plan describes the tests to be performed during the RCRA trial burn for the boilers. The Plan is designed to provide the necessary compliance demonstrations for RCRA. It is being submitted in accordance with 40 CFR § 270.19(b) and LAC 33:V.535.D as part of the requirements for a Resource Conservation and Recovery Act Part B Permit Application.

1.1 Facility Overview

The BASF facility is located adjacent to the Mississippi River on over 2,000 acres, most of which is located to the southwest of State Highway 30. The plant is approximately two kilometers southeast of Geismar, Louisiana, and 19 km south of Baton Rouge, Louisiana. The facility is surrounded by land used primarily for industrial and agricultural purposes. The facility produces various chemical products and intermediates.

The street address of the BASF Geismar facility is:

BASF Corporation
8404 River Road
Geismar, Louisiana 70734-0457

All correspondence should be directed to the facility contact at the following address and telephone number:

Dana M. Scott
EHS LA Hub Team Member
BASF Corporation
P.O. Box 457
Geismar, Louisiana 70734-0457
(225) 339-2570

BASF operates three boilers that burn hazardous waste. The Amines Boiler burns waste liquid fuels and off gases generated by the Specialty Amines production unit. The Utilities boilers burn waste liquid fuels and off gases from several production processes at the Geismar facility.

1.2 RCRA General Information

Boilers that burn hazardous waste are subject to the BIF performance standards of 40 CFR Part 266 Subpart H and LAC 33:V Chapter 30. The performance standards of Subpart H include:

- 40 CFR § 266.104 and LAC 33:V.3009.A.1, *Standards to Control Organic Emissions*, require a destruction and removal efficiency (DRE) of selected Principal Organic Hazardous Constituents (POHCs) of 99.99 percent and a carbon monoxide (CO) concentration in the stack gas below 100 parts per million by volume (ppmv) over an hourly rolling average, dry basis and corrected to seven percent oxygen.
- 40 CFR § 266.105 and LAC 33:V.3011.A, *Standards to Control Particulate Matter*, mandate that the boilers may not emit particulate matter (PM) in excess of 0.08 grains per dry standard cubic foot (gr/dscf) after correction to seven percent oxygen in the stack gas.
- 40 CFR § 266.106 and LAC 33:V.3013.A, *Standards to Control Metals Emissions*, require compliance with feed rate screening limits (Tier I or Adjusted Tier I) or emission rate screening limits (Tier II or Tier III) for each of ten metals.
- 40 CFR § 266.107 and LAC 33:V.3015.A, *Standards to Control HCl and Chlorine Gas*, require compliance with feed rate screening limits for total chlorine (Tier I or Adjusted Tier I) or with emission rate screening limits (Tier II or Tier III) for hydrogen chloride (HCl) and chlorine gas (Cl₂).

1.3 Background

In 1997, trial burns were performed for each of the three boilers to demonstrate compliance with the BIF emission standards and establish operating parameters. The test burns demonstrated compliance with all applicable emission standards. Since performing those test burns, BASF has complied with the interim status requirements for the boilers and performed a Recertification of Compliance (ROC) test every three years. As required, BASF has complied with the operating limits established in the ROC while under interim status. The Louisiana Department of Environmental Quality (LDEQ) recently provided a draft permit for which the 1997 test was utilized to establish operating limits. BASF has determined that some of the operating limits that were established from the 1997 testing do not provide the required operating flexibility for the boilers. Additionally, as indicated in prior correspondence with LDEQ, BASF plans to install a low NO_x burner on Utility Boiler No. 3 and new combustion air blowers on the Amines Boiler. Therefore, BASF has decided to perform additional trial burn testing for each boiler to establish certain new operating limits.

1.4 Trial Burn Summary

The trial burn has been designed to demonstrate compliance with the RCRA PM and DRE performance standards. The program consists of one test condition for the Amines Boiler and two test conditions each for Utility Boiler No. 3 and Utility Boiler No. 6. Table 1-1 summarizes the trial burn demonstrations for each boiler.

**Table 1-1
Trial Burn Condition Summary**

Boiler	Test Condition	Performance Standard Demonstration	Operating Limits Established
Amines Boiler	1	Particulate matter Destruction and removal efficiency	Maximum ash feed rate
			Maximum stack gas flow rate
Utility Boiler No. 3	2A	Particulate matter Destruction and removal efficiency	Maximum ash feed rate
			Maximum total hazardous waste feed rate
			Maximum stack gas flow rate
	2B	Destruction and removal efficiency	Minimum combustion chamber temperature
Utility Boiler No. 6	3A	Particulate matter Destruction and removal efficiency	Maximum ash feed rate
			Maximum stack gas flow rate
	3B	Destruction and removal efficiency	Minimum combustion chamber temperature

This trial burn is being coordinated by RMT, Inc. (RMT) under the direction of BASF personnel. RMT is responsible for the test protocol development and implementation and will oversee boiler operations and the stack sampling activities during the test program. METCO Environmental (METCO) will perform all of the stack sampling for the test program. METCO will be responsible for all emissions and process samples collected during the test program, with oversight by RMT. B3 Systems will provide waste spiking services during the test program. The emissions and process samples will be sent to the following laboratories for analysis: METCO and Severn Trent Laboratories, Inc. (STL). Dr. Robert Adams of METCO will act as the Quality Assurance Officer and will provide oversight of the stack sampling contractor during the testing. Additional information on the project team roles and responsibilities is provided in the Quality Assurance Project Plan (QAPP).

1.5 Test Plan Organization

This Plan has been prepared following the regulations codified in 40 CFR § 270.66 (LAC 33:V.535.A.1). The goal of the trial burn is to demonstrate that the boilers are operating in

compliance with the RCRA emission standards. The remaining sections of the Plan provide the following information:

- Section 2 presents a discussion on the target operating parameter limits for the boilers;
- Section 3 presents information on the boilers' feedstreams;
- Section 4 presents a detailed engineering description of the boilers;
- Section 5 presents a description of the boilers' continuous monitoring systems;
- Section 6 presents a description of the test operating conditions;
- Section 7 presents a summary of the test sampling and analysis procedures;
- Section 8 presents a description of the Trial Burn Report; and
- Appendix A includes the QAPP.



Section 2

Operating Parameter Limits

BASF will demonstrate compliance with the RCRA DRE and PM performance standards and will establish permit conditions for the boilers during the trial burn. The expected permit conditions are based on guidance provided in the USEPA's handbook *Guidance on Setting Permit Conditions and Reporting Trial Burn Results*, January 1989, (EPA/625/6-89/019) and on the provisions of 40 CFR Part 26. The guidance document groups permitted parameters into three groups (A, B, and C). Group A parameters are those that are strictly based on trial burn results and which require continuous monitoring. Group B parameters are also based on trial burn results, but these parameters do not require continuous monitoring. Group C parameters are established based on equipment design and operating specifications and are not monitored continuously.

2.1 Operating Parameter Limit Demonstrations

During the trial burn, BASF intends to re-establish some operating parameter limits for the boilers. The target operating limits that BASF plans to demonstrate during the trial burn and the anticipated permit limits are discussed below and are summarized in Table 2-1.

Table 2-1
Target Operating Parameter Limits

Operating Parameter	Target Value	Test Condition
Amines Boiler		
Maximum ash feed rate	2.0 lb/hr	1
Maximum stack gas flow rate	5,000 scfm	1
Utility Boiler No. 3		
Maximum ash feed rate	30 lb/hr	2A
Maximum total hazardous waste feed rate	28 gpm	2A
Maximum stack gas flow rate	65,000 scfm ¹	2A
Minimum combustion chamber temperature	1,100°F	2B
Utility Boiler No. 6		
Maximum ash feed rate	30 lb/hr	3A
Maximum stack gas flow rate	73,000 scfm ¹	3A
Minimum combustion chamber temperature	950°F	3B

¹ These target values are estimates that are subject to change prior to the trial burn. BASF will be installing monitors for these parameters prior to the testing. No historical data is available at this time to determine the appropriate target values. BASF intends to review operating data after the monitors are installed and may modify these target values.

2.1.1 Minimum Combustion Chamber Temperature

A minimum combustion chamber temperature is established to demonstrate compliance with the organic emission standards of 40 CFR § 266.104 as appropriate.

40 CFR § 266.102(e)(2)(i)(E) requires that the minimum combustion chamber temperature limit be established on either an instantaneous basis or an hourly rolling average (HRA) basis. Combustion chamber temperature is a Group A parameter and is continuously monitored. BASF intends to demonstrate the minimum combustion chamber temperature for Utility Boiler No. 3 and Utility Boiler No. 6.

The minimum combustion chamber temperature for Utility Boiler No. 3 will be established in Condition 2B. The target value for combustion chamber temperature in Condition 2B is 1,100 degrees Fahrenheit (°F).

The minimum combustion chamber temperature for Utility Boiler No. 6 will be established in Condition 3B. The target value for combustion chamber temperature in Condition 3B is 950°F.

The minimum combustion chamber temperature limits will be established as HRAs using the average of the lowest HRA value for each run.

2.1.2 Maximum Total Hazardous Waste Feed Rate

A maximum total hazardous waste feed rate must be established to demonstrate compliance with the organic emissions standards of 40 CFR § 266.104. 40 CFR § 266.102(e)(2)(i)(A) requires that the maximum total hazardous waste feed rate limit be established on either an instantaneous basis or an HRA basis. Maximum total hazardous waste feed rate is a Group A parameter and is continuously monitored. BASF intends to demonstrate the maximum total hazardous waste feed rate for Utility Boiler No. 3.

The maximum total hazardous waste feed rate for Utility Boiler No. 3 will be established in Condition 2A. The target value for total hazardous waste feed rate in Condition 2A is 28 gallons per minute (gpm). BASF will be modifying the burner systems of this boiler to achieve this new maximum feed rate.

2.1.3 Maximum Device Production Rate

A maximum device production rate is established to demonstrate compliance with the organic emissions standards of 40 CFR § 266.104 and the PM emissions standard of 40 CFR § 266.105 as appropriate. 40 CFR §§ 266.102(e)(2)(i)(B) and (e)(3)(i)(B) require that the maximum device production rate limit be established on either an instantaneous

basis or an HRA basis. Maximum device production rate is a Group A parameter and is continuously monitored. BASF is proposing that a maximum device production rate limit is not necessary for the boilers.

In the 1997 DRE Trial Burn Plan for the Amines Boiler (dated January 15, 1997), BASF demonstrated that the maximum steam production rate is not an appropriate operating limit for the boiler because of the flue gas recycle. The flue gas recycle has an effect on the amount of steam produced in the boiler. Therefore, the steam production rate is not a good indicator of combustion conditions in the Amines Boiler. LDEQ agreed with this justification, and a limit on production rate was not established for the boiler.

BASF is proposing that a limit on steam production rate is also not appropriate for Utility Boiler No. 3 and Utility Boiler No. 6. For these boilers, BASF intends to establish a new limit on stack gas flow rate as an indicator of combustion gas velocity. BASF believes that this limit provides the necessary combustion control for the boilers. In the Utility Boilers, the steam production rate is directly proportional to the heat input of the boilers. There is no recycled flue gas in these units. The stack gas flow rate is also directly related to the heat input. These two parameters are essentially indirectly monitoring the same condition of the boiler – heat input. Therefore, BASF believes that it is not necessary to establish a limit for both parameters. A limit on stack gas flow rate will be sufficient to demonstrate proper operations of the combustion systems.

2.1.4 Minimum Device Production Rate

A minimum device production rate is established to demonstrate compliance with the organic emissions standards of 40 CFR § 266.104 as appropriate. 40 CFR § 266.102(e)(2)(i)(B) requires that the minimum device production rate limit be established on either an instantaneous basis or an HRA basis. Minimum device production rate is a Group A parameter and is continuously monitored. BASF is proposing that a minimum device production rate limit is not necessary for the boilers.

As with the maximum steam production rate, minimum steam production rate is not an appropriate indicator of performance for the Amines Boiler. As stated previously, the steam production rate is dependent on factors other than the combustion characteristics of the boiler.

For the Utility Boilers, BASF believes that a minimum steam production rate limit is unnecessary. In these boilers, the condition that would result in minimum steam production would also result in the minimum combustion chamber temperature. BASF is proposing to establish minimum combustion chamber temperature limits for these

boilers during the trial burn. Therefore, we do not believe it is appropriate to also establish a minimum steam production rate limit.

2.1.5 Indicator of Combustion Gas Velocity

A limit on an appropriate indicator of combustion gas velocity is established to demonstrate compliance with the organic emissions standard of 40 CFR § 266.104 as appropriate. 40 CFR § 266.102(e)(2)(i)(F) requires that the combustion gas velocity indicator limit be established on either an instantaneous basis or an HRA basis. Combustion gas velocity is a Group A parameter and is continuously monitored. BASF intends to demonstrate the maximum stack gas flow rate for all three boilers.

The maximum stack gas flow rate for the Amines Boiler will be established in Condition 1. The target value for stack gas flow rate in Condition 1 is 5,000 standard cubic feet per minute (scfm). The normal operating range for the stack gas flow rate is 2,000 to 5,000 scfm.

The maximum stack gas flow rate for Utility Boiler No. 3 will be established in Condition 2A. The target value for stack gas flow rate in Condition 2A is 65,000 scfm. BASF will be installing a stack gas flow rate monitor prior to the trial burn. Historical data for stack gas flow rate is not available. BASF may adjust the target stack gas flow rate for the trial burn based on operating data collected after the monitor is installed.

The maximum stack gas flow rate for Utility Boiler No. 6 will be established in Condition 3A. The target value for stack gas flow rate in Condition 3A is 73,000 scfm. BASF will be installing a stack gas flow rate monitor prior to the trial burn. Historical data for stack gas flow rate is not available. BASF may adjust the target stack gas flow rate for the trial burn based on operating data collected after the monitor is installed.

The maximum stack gas flow rate limits will be established as HRAs using the average of the highest HRA value for each run.

2.1.6 Maximum Total Heat Input

Additional parameter limits may be established to demonstrate compliance with the organic emissions standards of 40 CFR § 266.104 as appropriate. 40 CFR § 266.102(e)(2)(i)(G) requires that these additional limits be established on either an instantaneous basis or an HRA basis. LDEQ has established limits for maximum total heat release for each boiler. BASF is proposing that these limits are unnecessary.

Establishing limits on maximum waste feed rate, maximum stack gas flow rate, and minimum combustion temperature provides a complete operating envelope for the boilers. Operating within these three limits ensures that the boilers are operating at conditions comparable to those of the trial burns. A total heat input limit does not provide any additional control on boiler conditions. Heat input and combustion gas flow rate have a direct correlation. The more heat that is fed to the boilers, the more combustion air that is required. Therefore, limiting combustion gas flow rate effectively limits the heat input to the boilers and eliminates the need to monitor this parameter directly.

2.1.7 Maximum Ash Feed Rate

Maximum ash feed rate is established to demonstrate compliance with the PM emission standard of 40 CFR § 266.105 as appropriate. 40 CFR § 266.102(e)(3)(i)(A) requires that the ash feed rate limit be established on either an instantaneous basis or an HRA basis. Ash feed rate is a Group B parameter that does not require continuous monitoring. BASF intends to demonstrate the maximum ash feed rate for all three boilers.

The maximum ash feed rate for the Amines Boiler will be established in Condition 1. The target value for ash feed rate in Condition 1 is 2.0 lb/hr. The Amines Boiler typically operates with very low ash feed. Ash content of the waste streams is typically below detection limit.

The maximum ash feed rate for Utility Boiler No. 3 will be established in Condition 2A. The target value for ash feed rate in Condition 2A is 30 lb/hr. Ash content of the waste streams fed to Utility Boiler No. 3 can range from less than 100 parts per million by weight (ppmw) to approximately 2,000 ppmw. The target ash feed rate was established to provide for operating flexibility given the range of ash content in the wastes.

The maximum ash feed rate for Utility Boiler No. 6 will be established in Condition 3A. The target value for ash feed rate in Condition 3A is 30 lb/hr. As with the wastes that are fed to Utility Boiler No. 3, the ash content of the waste streams fed to Utility Boiler No. 6 can range from less than 100 ppmw to approximately 2,000 ppmw. The target ash feed rate was established to provide for operating flexibility given the range of ash content in the wastes.

2.2 Permit Limits Summary

BASF intends to establish new operating parameter limits for the boilers during this trial burn. BASF also intends to retain some of the operating parameter limits that were established during the previous trial burns conducted in 1997. Table 2-2 lists all of the operating parameter limits that have been or will be demonstrated through testing for each of the boilers.

Table 2-2
Operating Parameter Limits Demonstrated Through Testing

Operating Parameter	Group	Limit	Averaging Period	Demonstration
<i>Antines Boiler</i>				
Minimum oxidizer combustion chamber temperature	A	1,990°F	HRA	1997 Trial Burn
Minimum reoxidizer combustion chamber temperature	A	1,596°F	HRA	1997 Trial Burn
Maximum total hazardous waste feed rate	A	1,206 lb/hr	HRA	1997 Trial Burn
Maximum stack gas flow rate	A	5,000 scfm	HRA	New Trial Burn
Maximum ash feed rate	B	2.0 lb/hr	NA	New Trial Burn
Maximum chlorine/chloride feed rate	B	260 g/hr	NA	2004 Recertification of Compliance Test
Maximum metals feed rates Antimony Arsenic Barium Beryllium Cadmium Chromium Lead Mercury Silver Thallium	B	195 g/hr 0.16 g/hr 31,500 g/hr 0.12 g/hr 0.17 g/hr 0.4 g/hr 54 g/hr 45 g/hr 1,900 g/hr 323 g/hr	NA	2004 Recertification of Compliance Test
<i>Utility Boiler No. 3</i>				
Minimum combustion chamber temperature	A	1,100°F	HRA	New Trial Burn
Maximum total hazardous waste feed rate	A	28 gpm	HRA	New Trial Burn
Maximum stack gas flow rate	A	65,000 scfm	HRA	New Trial Burn
Maximum ash feed rate	B	30 lb/hr	NA	New Trial Burn
Maximum chlorine/chloride feed rate	B	450 g/hr	NA	2004 Recertification of Compliance Test

Table 2-2 (continued)
Operating Parameter Limits Demonstrated Through Testing

Operating Parameter	Group	Limit	Averaging Period	Demonstration
Maximum metals feed rates Antimony Arsenic Barium Beryllium Cadmium Chromium Lead Mercury Silver Thallium	B	200 g/hr 1.3 g/hr 35,000 g/hr 0.4 g/hr 0.65 g/hr 1.95 g/hr 230 g/hr 275 g/hr 3,400 g/hr 500 g/hr	NA	2004 Recertification of Compliance Test
Utility Boiler No. 6				
Minimum combustion chamber temperature	A	950°F	HRA	New Trial Burn
Maximum total hazardous waste feed rate	A	11 gpm	HRA	1997 Trial Burn
Maximum stack gas flow rate	A	73,000 scfm	HRA	New Trial Burn
Maximum ash feed rate	B	30 lb/hr	NA	New Trial Burn
Maximum chlorine/chloride feed rate	B	450 g/hr	NA	2004 Recertification of Compliance Test
Maximum metals feed rates Antimony Arsenic Barium Beryllium Cadmium Chromium Lead Mercury Silver Thallium	B	200 g/hr 0.81 g/hr 35,000 g/hr 0.4 g/hr 0.65 g/hr 1.6 g/hr 230 g/hr 250 g/hr 3,200 g/hr 480 g/hr	NA	2004 Recertification of Compliance Test



Section 3

Waste Characterization

All of the wastes burned in BASF's boilers originate from on-site production processes. The wastes are directly transferred from the on-site processes to the boilers. A brief description of the wastes processed in each boiler is provided in the sections that follow. More detailed descriptions of these waste streams can be found in the facility's *RCRA Part B Permit Application*.

The boilers have been designed to accommodate these feed streams in a safe and reliable manner. As the sections that follow demonstrate, the physical and chemical properties of the anticipated waste feed will vary. The waste feeds and spiking materials chosen for the trial burn have been carefully structured to demonstrate system performance within an established envelope that will provide operating flexibility to meet current and future needs, while complying with all environmental regulations.

3.1 Amines Boiler

The wastes that are burned in the Amines Boiler are generated from the production of a variety of specialty amines. These wastes are characteristically hazardous for ignitability (D001) and also may carry the F003 code. F003 wastes may include any of the following spent non-halogenated solvents: xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol. These wastes are generally low in ash, chlorine, and metals content. Occasionally, detectable levels of ash, chlorine, chromium, and nickel may be reported in the waste analyses. Table 3-1 provides information on the typical characteristics of the wastes that are fed to the Amines Boiler. The data provided in the table is based upon waste analyses conducted between December 2002 and December 2005.

Table 3-1
Summary of Typical Waste Characteristics for the Amines Boiler Wastes

Parameter	Units	Range
Heating value	Btu/lb	8,000 - 12,000
Total chlorine/chloride	mg/kg	ND ¹ - 150
Ash	mg/kg	ND - 1,500
<i>Metals:</i>		
Antimony	mg/kg	ND
Arsenic	mg/kg	ND
Barium	mg/kg	ND
Beryllium	mg/kg	ND
Cadmium	mg/kg	ND
Chromium	mg/kg	ND - 2.5
Lead	mg/kg	ND
Mercury	mg/kg	ND
Silver	mg/kg	ND
Thallium	mg/kg	ND

¹ ND indicates that all analyses were reported as non-detect.

3.2 Utility Boiler No. 3

The wastes that are burned in Utility Boiler No. 3 are generated from the tetrahydrofuran (THF), Carboxy, Diols, and polytetrahydrofuran (PolyTHF) production units. These wastes are characteristically hazardous for ignitability (D001) and typically consist of methanol, PolyTHF, light-end hydrocarbons, isopropanol, and/or mixed alcohols. They are generally low in ash, chlorine, and metals content. Occasionally, detectable levels of ash and chlorine may be reported in the waste analyses. Table 3-2 provides information on the typical characteristics of the wastes that are fed to Utility Boiler No. 3. The data provided in the table is based upon waste analyses conducted between December 2002 and December 2005.

Table 3-2
Summary of Typical Waste Characteristics for Utility Boiler No. 3 Wastes

Parameter	Units	Range
Heating value	Btu/lb	10,000 - 15,000
Total chlorine/chloride	mg/kg	ND ¹ - 150
Ash	mg/kg	100 - 2,000
<i>Metals:</i>		
Antimony	mg/kg	ND
Arsenic	mg/kg	ND
Barium	mg/kg	ND
Beryllium	mg/kg	ND
Cadmium	mg/kg	ND
Chromium	mg/kg	ND - 2.5
Lead	mg/kg	ND
Mercury	mg/kg	ND
Silver	mg/kg	ND
Thallium	mg/kg	ND

¹ ND indicates that all analyses were reported as non-detect.

3.3 Utility Boiler No. 6

The wastes that are burned in Utility Boiler No. 6 are generated from the THF, toluene diisocyanate (TDI), Carboxy, Diols, and PolyTHF production units. These wastes are characteristically hazardous for ignitability (D001) and typically consist of methanol, PolyTHF, light-end hydrocarbons, isopropanol, mixed alcohols, and/or waste diamine vicinals. They are generally low in ash, chlorine, and metals content. Occasionally, detectable levels of ash and chlorine may be reported in the waste analyses. Table 3-3 provides information on the typical characteristics of the wastes that are fed to Utility Boiler No. 6. The data provided in the table is based upon waste analyses conducted between December 2002 and December 2005.

Table 3-3
Summary of Typical Waste Characteristics for Utility Boiler No. 6 Wastes

Parameter	Units	Range
Heating value	Btu/lb	10,000 – 15,000
Total chlorine/chloride	mg/kg	ND ¹ – 150
Ash	mg/kg	100 – 2,000
<i>Metals:</i>		
Antimony	mg/kg	ND
Arsenic	mg/kg	ND
Barium	mg/kg	ND
Beryllium	mg/kg	ND
Cadmium	mg/kg	ND
Chromium	mg/kg	ND – 2.5
Lead	mg/kg	ND
Mercury	mg/kg	ND
Silver	mg/kg	ND
Thallium	mg/kg	ND

¹ ND indicates that all analyses were reported as non-detect.



Section 4

Engineering Description

BASF operates three boilers which co-fire hazardous waste derived fuel and fuel gas for energy recovery. These three units are designated as the Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6. The following sections provide a description of each boiler system.

4.1 Amines Boiler

BASF has been operating the Amines Boiler since 1988. The boiler has a design thermal capacity of 8.7 million British thermal units per hour (MMBtu/hr) and is capable of producing a maximum of 9,000 lb/hr of 650 pounds per square inch gauge (psig) steam at 650°F. The boiler was manufactured by McGill Environmental and is a three-zone, low-NO_x design capable of burning natural gas, liquid fuels and off gases from unit production vents. The main components of the Amines Boiler are the oxidizing zone, a reducing zone, a reoxidation zone, a waste heat boiler with an economizer, an induced draft (ID) fan, a main stack, and an emergency stack. The combustor of the Amines Boiler is horizontal with refractory lining and has a cross-section of approximately 23.4 square feet at the widest section of the chamber. The stack of Amines Boiler is approximately 79 feet above grade. A schematic of the Amines Boiler is provided in Figure 4-1.

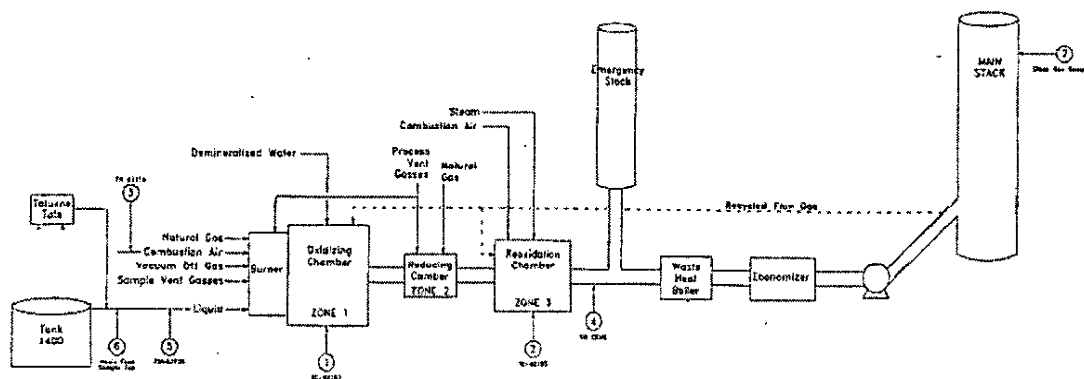
Liquid wastes that are fed to the Amines Boiler are generated from the production of a variety of specialty amines and arrive at the steam plant directly from the on-site plant processes that generate them. The liquid fuels for the boiler are stored in Tank TK-1400. In addition to the production wastes, methanol is periodically burned in the Amines Boiler. The methanol is used to flush the lines and equipment and is only fed between the production of specialty amines.

In addition to natural gas, which is used as the primary fuel and is purchased from a supplier, supplemental gaseous fuels are also used. The supplemental gaseous fuels consist of process vent gases, which are generated in a variety of sources from the morpholine and amines production plants. The vent gases are generated from the vessel pressure control systems. The pressure control systems utilize nitrogen and normal process vapor pressure to provide the appropriate operating pressures within the reactor and distillation systems. Some vent gases are also generated from vacuum pumps and compressors that remove air from vacuum distillation systems and other pumps that provide purge air. High-pressure systems that require purge of inert or contaminated gases from reactor and distillation vessels are another source of vent gases.

The first zone of the three-zone combustion system is an oxidizing chamber where the liquid waste fuels and off gases are first introduced. The normal operating temperature range of this zone is 2,200 °F to 2,600°F with a minimum oxygen content of 0.5 percent. The estimated residence time of this zone is approximately three seconds. The oxidizing chamber is followed by a reducing zone. In this zone, combustion gases and additional fuels are added to provide sub-stoichiometric oxygen environment to convert nitrogen oxides (NO_x) to nitrogen. The temperature is not controlled in this zone, but typically runs 100°F to 200°F cooler than the oxidizing chamber. The residence time of this chamber is also estimated to be three seconds. The final zone is the reoxidation chamber. In this zone, the remaining residual combustibles from the reducing zone are completely consumed by adding combustion air. No auxiliary fuel is introduced in this zone. Steam or recycle flue gas is added for temperature control. The residence time of this section is also estimated to be three seconds.

The system is equipped with a horizontal fire tube boiler and a package economizer. After exiting the reoxidation zone, the gases pass through the boiler section and the economizer, reducing the gas temperature to 350°F to 500°F. The gases exit through either the emergency stack or main stack after exiting the economizer. When the boiler is shut down, process vents are still burned and the flue gas is directed through the emergency stack. Otherwise, the flue gases exit through the main stack.

Figure 4-1
Amines Boiler Schematic



4.2 Utility Boiler No. 3

Utility Boiler No. 3 was manufactured by Babcock & Wilcox and has been in operation since 1958. The boiler has a design thermal capacity of 285 MMBtu/hr and is capable of producing a maximum of 205,000 lb/hr of 650-psig steam at 750°F. The boiler was designed to burn natural gas, vent gases, and liquid fuels. The main components of Utility Boiler No. 3 are the firebox, a

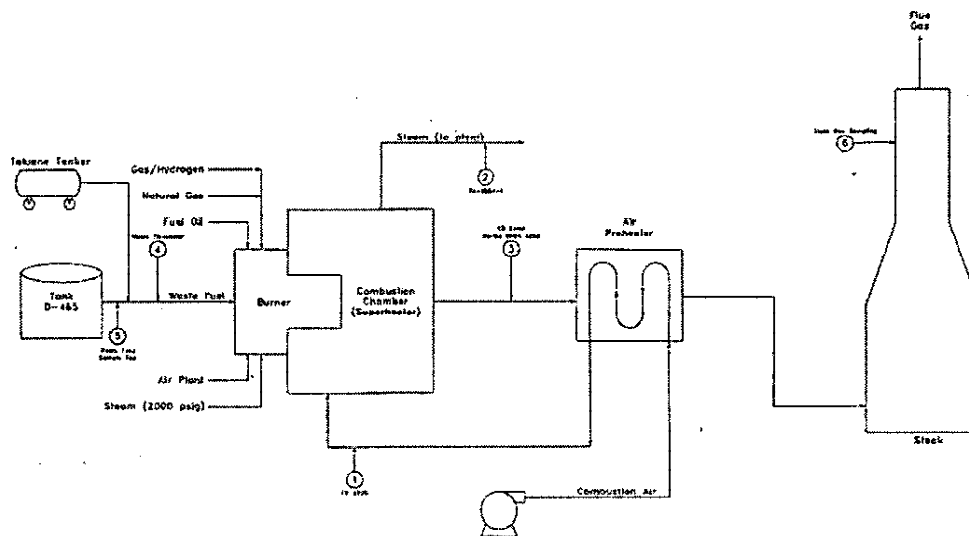
superheater, an economizer, a forced draft fan, and a stack. The stack is approximately 75 feet above grade. A schematic of Utility Boiler No. 3 is provided in Figure 4-2.

Typically, Utility Boiler No. 3 utilizes natural gas for approximately 85 percent of the fuel requirements, with liquid hazardous waste comprising the other 15 percent. Natural gas is the primary fuel for this boiler. However, the boiler has the capability of burning hydrogen and fuel oil.

The liquid wastes that are fed to Utility Boiler No. 3 are generated from the production tetrahydrofuran and polytetrahydrofuran and arrive at the unit directly from the on-site plant processes that generate them. The wastes consist of methanol, light ends, isopropanol, or mixed alcohols. The methanol and mixed alcohols are products of the production of 1,4-Butanediol. All waste streams are hard-piped from the production areas to storage tanks, D-465 and TK-795.

In addition to natural gas, the boiler also has the capability to burn supplemental gaseous fuel. The supplemental gaseous fuel consist of hydrogen and carbon monoxide. The supplemental gaseous fuel is integrated into the main fuel (natural gas) feed as an auxiliary fuel prior to combustion.

Figure 4-2
Utility Boiler No. 3 Schematic



4.3 Utility Boiler No. 6

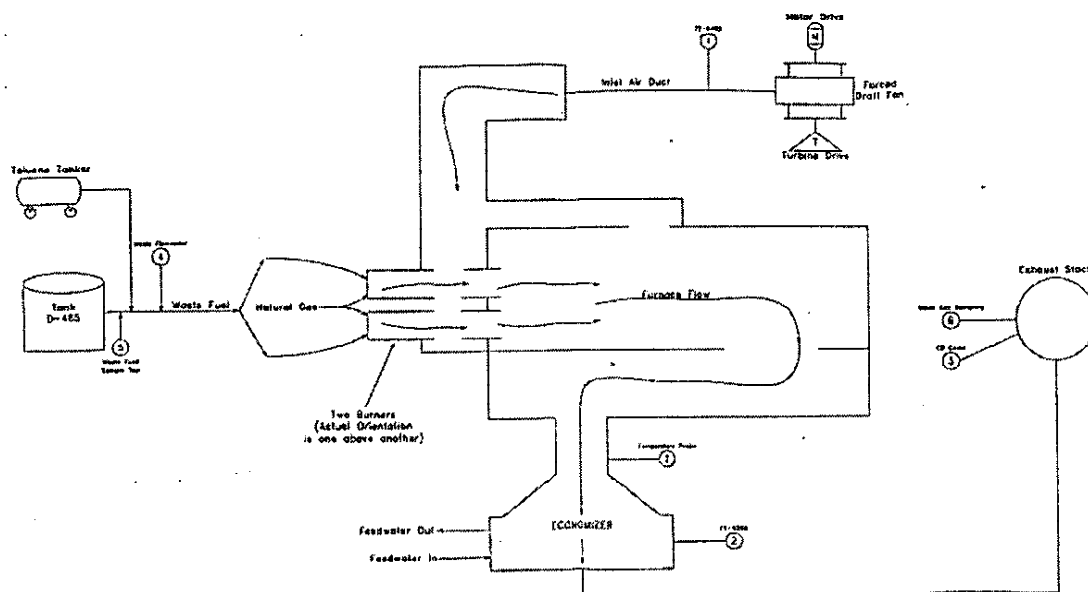
Utility Boiler No. 6 was manufactured by Babcock & Wilcox and has been operation since 1976. The boiler has a design thermal capacity of 250 MMBtu/hr and is capable of producing a

maximum of 220,000 lb/hr of 650-psig steam at 750°F. The boiler is a "D"-shaped gas-fired package boiler with an economizer and NO_x controls. It was designed to burn natural gas, vent gases, and waste liquid fuels. The main components of Utility Boiler No. 6 are a firebox, a superheater, an economizer, a forced draft fan, and a stack. Utility Boiler No. 6 is comparable to Utility Boiler No. 3 in function and wastes burned. However, Utility Boiler No. 6 has a lower residence time and a shorter stack. The stack is approximately 60 feet tall. A schematic of Utility Boiler No. 6 is provided in Figure 4-3.

Typically, Utility Boiler No. 6 utilizes natural gas for approximately 85 percent of the fuel requirements, with liquid hazardous waste comprising the other 15 percent of fuel requirements. Natural gas is the primary fuel for this boiler.

The liquid wastes that are burned in Utility Boiler No. 6 are generated from the production tetrahydrofuran and polytetrahydrofuran and arrive at the unit directly from the on-site plant processes that generate them. The wastes consist of methanol, mixed alcohols, and waste diamine vicinals. The methanol and mixed alcohols are products of the production of 1,4-Butanediol and the diamine vicinals come from the production of toluene diamine. All waste streams are hard-piped from the production areas to a storage tank, TK-795, which feeds the boiler.

Figure 4-3
Utility Boiler No. 6 Schematic





Section 5

Monitoring

Monitoring equipment for the boilers includes systems for process control and for stack gas analysis. This equipment enables the operators of the facility to maintain safe operation in compliance with the operating limits. This section of the Plan provides an overview of the continuous process monitoring systems and continuous emissions monitoring systems of the boilers.

5.1 Continuous Monitoring Systems

To ensure safe operations, the boilers are equipped with various process monitors that are linked to the control system for process control and a programmable logic controller (PLC) for calculation of regulatory parameters. Table 5-1 provides a description of the process monitors used for regulatory compliance on each boiler. The tables include information on tag numbers, instrument type, and range. Each of these process monitors is calibrated annually following standard plant procedures. A calibration check of all these monitors will be performed prior to the trial burn testing. Some of these monitors also function as automatic waste feed cutoff (AWFCO) devices. These devices are detailed in Section 5.4.

Table 5-1
Process Monitors

Tag	Description	Type	Range
<i>Amines Boiler</i>			
TC 82102	Oxidizer chamber temperature	Type R thermocouple	500 – 2,900°F
TC 82105	Reoxidizer chamber temperature	Type K thermocouple	100 – 2,500°F
FR 82700	Liquid waste feed rate	Micro Motion mass flow meter	0 – 1,300 lb/hr
FR 83116	Stack gas flow meter	Annubar flow meter	0 – 6,500 scfm
<i>Utility Boiler No. 3</i>			
TI 3732	Combustion chamber temperature	Type K thermocouple	0 – 2,400°F
FIC 3334	Liquid waste feed rate	Orifice plate	0 – 42 gpm
FIT 13001	Stack gas flow meter	TBD ¹	TBD ¹
<i>Utility Boiler No. 6</i>			
TI 6201	Combustion chamber temperature	Type K thermocouple	0 – 2,400°F
FT 6018	Liquid waste feed rate	Orifice plate	0 – 12 gpm
FIT 16001	Stack gas flow meter	TBD ¹	TBD ¹

¹ To be determined. Monitors will be installed prior to trial burn.

5.2 Constituent Feed Rate Determinations

The feed rate of each regulated constituent (ash, chlorine, metals) to the boiler is determined through quarterly waste analysis. The constituent concentrations determined in the quarterly waste analysis will be used to calculate maximum possible constituent feed rates using the maximum hazardous waste feed rate limit. These maximum constituent feed rates are compared to the permit limits to demonstrate compliance.

5.3 Continuous Emissions Monitoring Systems

The stack gases are continuously monitored for oxygen and CO concentration via continuous emission monitoring systems (CEMS) in accordance with Appendix X of 40 CFR Part 266, *Methods Manual for Compliance with the BIF Regulations*. The CEMS are extractive type systems that draw the flue gas through probes, through heated sample lines, and into the analyzers. The stack emissions are filtered prior to reaching the analyzers to remove moisture and particulate. Table 5-2 provides information on the CEMS used on each boiler.

Table 5-2
Continuous Emissions Monitoring Systems

Boiler	Monitor	Manufacturer	Model	Range
Amines Boiler	Carbon monoxide	Thermo Environmental	48H	0 - 200 ppmv 0 - 3,000 ppmv
	Oxygen	Servomex	1420B	0 - 25 % vol dry
Utility Boiler No. 3	Carbon monoxide	Horiba Enda	1250	0 - 200 ppmv 0 - 3,000 ppmv
	Oxygen	Horiba Enda	1250	0 - 25 % vol dry
Utility Boiler No. 6	Carbon monoxide	Horiba Enda	1250	0 - 200 ppmv 0 - 3,000 ppmv
	Oxygen	Horiba Enda	1250	0 - 25 % vol dry

The CEMS are maintained using a specified maintenance routine, which includes:

- Routine maintenance;
- Daily auto calibrations;
- Quarterly Calibration Error Tests; and
- Annual Performance Specification Tests.

Any problems identified by the above tests are remediated through corrective action measures specific to the problem encountered.

5.4 Automatic Waste Feed Cutoff System

40 CFR § 266.102(e)(7)(ii) requires that a facility operate the boilers with functioning systems that automatically cut off the hazardous waste feed when operating conditions deviate from those established in the permit. BASF will operate an AWFCO system for each boiler in accordance with the RCRA Part B permit. All of the process parameters listed in Table 5-1, in addition to the CO CEMS, will be included in the AWFCO system. Table 5-3 provides a list of the expected cutoff triggers for each parameter. All trigger limits will be established as HRAs. The actual trigger values for some of the AWFCOs will be determined by the results of the trial burn; limits for others are based on demonstrations made during the 1997 Trial Burn.

**Table 5-3
Future Automatic Waste Feed Cutoffs**

Tag	Description	Trigger Limit	Averaging Period
<i>Amines Boiler</i>			
TC 82102	Minimum oxidizer chamber temperature	1,990°F	HRA
TC 82105	Minimum reoxidizer chamber temperature	1,596°F	HRA
FR 82700	Maximum liquid waste feed rate	1,206 lb/hr	HRA
FR 83116	Maximum stack gas flow rate	5,000 scfm ¹	HRA
<i>Utility Boiler No. 3</i>			
TI 3732	Minimum combustion chamber temperature	1,100°F ¹	HRA
FIC 3334	Maximum liquid waste feed rate	28 gpm ¹	HRA
FIT 13001	Maximum stack gas flow rate	65,000 scfm ¹	HRA
<i>Utility Boiler No. 6</i>			
TI 6201	Minimum combustion chamber temperature	1,800°F ¹	HRA
FT 6018	Maximum liquid waste feed rate	11 gpm	HRA
FIT 16001	Maximum stack gas flow rate	73,000 scfm ¹	HRA

¹ This operating limit is a target value. Actual value will depend on the results of the trial burn.

5.5 Emergency Shutdown System

Emergency shutdown features are included to protect the equipment in the event of a malfunction. An emergency shutdown will stop the waste feed and the fuel feed when triggered by a monitor signal. These parameter limits have been set independently of regulatory test conditions. These limits are based on equipment design and operating specifications and are considered good operating practices.

The following conditions will trigger a complete shutdown of the Amines Boiler:

- High Zone 1 temperature (> 2,800°F);

- High Zone 3 temperature ($> 2,200^{\circ}\text{F}$);
- Low atomizing air pressure (< 50 psig);
- High pilot fuel gas pressure (> 25 psig);
- High burner fuel gas pressure (> 50 psig);
- Low fuel gas pressure (< 15 psig);
- Low combustion air flow rate (< 400 scfm); and
- Loss of flame signal.

The following conditions will trigger a complete shutdown of the Utility Boiler No. 3:

- High natural gas pressure (> 12 psig);
- Low main natural gas pressure (< 25 psig);
- High burner natural gas pressure (> 12 psig);
- Low combustion air flow rate (< 25 percent valve);
- Low steam drum level (< 7.13 percent);
- High furnace pressure (> 7 in. w.c.);
- Low instrument air pressure (< 35 psig); and
- Loss of flame signal.

The following conditions will trigger a complete shutdown of the Utility Boiler No. 6:

- Low natural gas pressure (< 1.5 psig);
- High natural gas pressure (> 8 psig);
- Low combustion air flow rate (< 24 percent valve);
- Low steam drum level (< 15 percent);
- High furnace pressure (> 12 in. w.c.);
- Low instrument air pressure (< 60 psig); and
- Loss of flame signal.



Section 6

Trial Burn Operations

BASF intends to perform one test condition for the Amines Boiler and two test condition each for Utility Boiler No. 3 and Utility Boiler No. 6 to demonstrate conformance with the applicable RCRA performance standards and to establish permit limits. This section of the Plan establishes the boiler operations that will be demonstrated during the testing. In addition, the preparation of materials to be fed during the testing, the amount of waste to be used, and a schedule for the testing are presented here.

6.1 Amines Boiler

One trial burn condition will be performed for the Amines Boiler. Condition 1 will be performed to demonstrate compliance with the PM emission standard of 40 CFR § 266.105 and the organic emission standard of 40 CFR § 266.104. Triplicate sampling runs will be performed for the condition. All flow rates, heat release values, and operating conditions presented in this Plan are calculated values; the actual conditions observed during the test may vary slightly from these values. During Condition 1, BASF will establish the maximum ash feed rate limit and the maximum stack gas flow rate limit for the boiler. The waste stream will be spiked with a titanium dioxide dispersion and the chosen POHC. A summary of the operating conditions for Condition 1 is provided in Table 6-1.

Table 6-1
Amines Boiler: Condition 1

Operating Parameter	Units	Target Value ¹
Oxidizer combustion chamber temperature	°F	2,300
Reoxidizer combustion chamber temperature	°F	1,900
Hazardous waste feed rate	lb/hr	1,000
Steam production rate	Mlb/hr	7.0
Stack gas flow rate	scfm	5,000
Ash feed rate	lb/hr	2.0
<i>Estimated Stack Gas Conditions:</i>		
Stack gas temperature	°F	350
Stack gas flow rate	acfm	7,600
	dscfm	4,500
Stack gas oxygen concentration	% vol dry	> 2.5

¹ Target OPLs shown in **bold text**.

6.2 Utility Boiler No. 3

Two trial burn conditions will be performed for Utility Boiler No. 3. Condition 2A will be performed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104 and the PM emission standard of 40 CFR § 266.105. Condition 2B will be performed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104.

6.2.1 Condition 2A

Condition 2A is designed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104 and the PM emission standard of 40 CFR § 266.105. Triplicate sampling runs will be performed for the condition. All flow rates, heat release values, and operating conditions presented in this Plan are calculated values; the actual conditions observed during the test may vary slightly from these values. During Condition 2A, BASF will establish the maximum ash feed rate limit and the maximum stack gas flow rate for the boiler. The waste stream will be spiked with a titanium dioxide dispersion and the chosen POHC. A summary of the operating conditions for Condition 2A is provided in Table 6-2.

Table 6-2
Utility Boiler No. 3: Condition 2A

Operating Parameter	Units	Target Value ¹
Combustion chamber temperature	°F	2,000
Hazardous waste feed rate	gpm	28
Steam production rate	Mlb/hr	175
Stack gas flow rate	scfm	65,000
Ash feed rate	lb/hr	30
<i>Estimated Stack Gas Conditions:</i>		
Stack gas temperature	°F	400
Stack gas flow rate	dscfm	54,000
Stack gas oxygen concentration	% vol dry	> 1.0

¹ Target OPLs shown in bold text.

6.2.2 Condition 2B

Condition 2B is designed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104. Triplicate sampling runs will be performed for the condition. All flow rates, heat release values, and operating conditions presented in this Plan are calculated values; the actual conditions observed during the test may vary slightly from these values. During Condition 2B, BASF will establish the minimum combustion chamber temperature limit for the boiler. The waste stream will be spiked with the

chosen POHC. A summary of the operating conditions for Condition 2B is provided in Table 6-3.

Table 6-3
Utility Boiler No. 3: Condition 2B

Operating Parameter	Units	Target Value ¹
Combustion chamber temperature	°F	1,100
Hazardous waste feed rate	gpm	1
Steam production rate	Mlb/hr	20
Stack gas flow rate	scfm	7,050
<i>Estimated Stack Gas Conditions:</i>		
Stack gas temperature	°F	270
Stack gas flow rate	dscfm	6,000
Stack gas oxygen concentration	% vol dry	> 1.0

¹ Target OPLs shown in bold text.

6.3 Utility Boiler No. 6

Two trial burn conditions will be performed for Utility Boiler No. 6. Condition 3A will be performed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104 and the PM emission standard of 40 CFR § 266.105. Condition 3B will be performed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104.

6.3.1 Condition 3A

Condition 3A is designed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104 and the PM emission standard of 40 CFR § 266.105. Triplicate sampling runs will be performed for the condition. All flow rates, heat release values, and operating conditions presented in this Plan are calculated values; the actual conditions observed during the test may vary slightly from these values. During Condition 3A, BASF will establish the maximum ash feed rate limit and the maximum stack gas flow rate for the boiler. The waste stream will be spiked with a titanium dioxide dispersion and the chosen POHC. A summary of the operating conditions for Condition 3A is provided in Table 6-4.

Table 6-4
Utility Boiler No. 6: Condition 3A

Operating Parameter	Units	Target Value ¹
Combustion chamber temperature	°F	2,000
Hazardous waste feed rate	gpm	8.4
Steam production rate	Mlb/hr	220
Stack gas flow rate	scfm	73,000
Ash feed rate	lb/hr	30
<i>Estimated Stack Gas Conditions:</i>		
Stack gas temperature	°F	425
Stack gas flow rate	dscfm	62,000
Stack gas oxygen concentration	% vol dry	> 1.0

¹ Target OPLs shown in bold text.

6.3.2 Condition 3B

Condition 3B is designed to demonstrate compliance with the organic emission standard of 40 CFR § 266.104. Triplicate sampling runs will be performed for the condition. All flow rates, heat release values, and operating conditions presented in this Plan are calculated values; the actual conditions observed during the test may vary slightly from these values. During Condition 3B, BASF will establish the minimum combustion chamber temperature limit for the boiler. The waste stream will be spiked with the chosen POHC. A summary of the operating conditions for Condition 3B is provided in Table 6-5.

Table 6-5
Utility Boiler No. 6: Condition 3B

Operating Parameter	Units	Target Value ¹
Combustion chamber temperature	°F	950
Hazardous waste feed rate	gpm	1
Steam production rate	Mlb/hr	22
Stack gas flow rate	scfm	7,200
<i>Estimated Stack Gas Conditions:</i>		
Stack gas temperature	°F	350
Stack gas flow rate	dscfm	6,000
Stack gas oxygen concentration	% vol dry	> 1.0

¹ Target OPLs shown in bold text.

6.4 Selection of Principal Organic Hazardous Constituents

As provided in 40 CFR § 270.66(e), POHCs must be designated for a trial burn, and a DRE for these compounds must be demonstrated for the boilers. The POHC must be chosen based on the degree of difficulty of incineration of the organic constituents in the waste. There are two primary ranking hierarchies used as criteria in the selection of POHCs to ensure that the POHCs chosen represent the widest range of compounds expected to be burned.

The first ranking is the USEPA's incinerability list, included in USEPA's *Guidance Manual for Hazardous Waste Incinerator Permits*, July 1983, (EPA/SW-966), which ranks compounds by heat of combustion. This list is divided into three groups, of which Group I contains compounds with heats of combustion that range from zero to 3.99 kilocalories per gram (kcal/g). As a group, these compounds are generally highly halogenated ethylenes, benzenes, and ethanes. Any compound in Group I is generally considered difficult to burn and is not normally used as a fuel. These compounds, therefore, make acceptable POHCs.

The heat of combustion approach to POHC selection is based on equilibrium theories which claim that the primary concern in evaluating the difficulty of destruction for a compound is the amount of energy necessary to complete the combustion process and form water, carbon dioxide, and, in some cases, an acid gas, as final combustion products. The second POHC selection approach is based on the Thermal Stability Index (TSI) developed by Dellinger *et. al.*, at the University of Dayton Research Laboratory. This approach has been included in the USEPA's handbook *Guidance on Setting Permit Conditions and Reporting Trial Burn Results*, January 1989, (EPA/625/6-89/019). This ranking of compounds is based on their thermal stability, with the most stable being considered the most difficult to burn. The compounds are divided into seven classes. Compounds in Class 1 are considered the most difficult to burn. Therefore, these compounds make acceptable POHCs.

In addition to these two organic compound rankings, POHC selection was influenced by other criteria as follows:

- *Physical State:* POHCs have been limited to those constituents that are miscible liquids at ambient temperatures and pressures to facilitate POHC handling and quantification;
- *Stability:* Compounds selected as POHCs are sufficiently stable and have boiling points suitable for conventional stack sampling techniques;
- *Representative:* The compounds selected as POHCs are representative of the types of constituents that the systems will typically handle; and
- *Availability and cost:* The compounds selected as POHCs are sufficiently available so that they can be purchased or formulated at a reasonable cost and are all in common use.

BASF is proposing to use toluene as the POHC for the trial burn. Toluene is in Class 2 of the TSI. The wastes burned in the boilers do not contain any of the compounds included in Class 1 of the TSI. Therefore, demonstrating DRE with a Class 2 compound should provide the required operating flexibility for the boilers.

Toluene has a heating value of 10.14 kilocalories per gram (kcal/g) and is ranked 35th on the TSI, making it a Class 2 compound. Toluene is suitable for current stack sampling methods. The VOST (SW-846 Method 0030) method is typically used to sample stack gas for toluene.

The properties of the selected POHC are provided in Table 6-6.

Table 6-6
Properties of Selected POHC

Property	Toluene
Synonyms	Methylbenzene
Formula	C ₇ H ₈
Chemical Abstract Service	108-88-3
Molecular weight, lb/lbmol	92.13
Boiling point, °C	110.6
Heat of combustion, kcal/g	10.14
Incinerability ranking ¹	284
Thermal stability ranking ²	Class 2, 35

¹ *Guidance Manual for Hazardous Waste Incinerator Permits*, USEPA, EPA/SW-966, July 1983.

² *Guidance on Setting Permit Conditions and Reporting Trial Burn Results - Volume II of the Hazardous Waste Incineration Guidance Series*, USEPA, EPA/625/6-89/019, January 1989.

6.5 POHC Feed Rates

The amount of POHC detected in the stack gases will be used to determine the DRE for the boilers. DRE is defined in 40 CFR § 266.104(a). DRE is determined for the POHC from the following equation:

$$DRE = \left[1 - \frac{W_{out}}{W_{in}} \right] \times 100$$

where:

W_{out} = Mass emission rate of the POHC present in exhaust emissions prior to release to the atmosphere; and
 W_{in} = Mass feed rate of the same POHC in the waste feed.

The POHC must be supplied to the boilers in sufficient quantity to be detectable in the stack gas. Each stack sampling method has a minimum detection limit. Using the most conservative approach for the test, any compound which is found to be present in the stack gas at quantities below the method minimum detection limit or that is undetected in the stack gases is assumed to be present at the minimum detection limit. Therefore, it is very important to ensure that there is adequate quantity of POHC in the boiler feed to demonstrate the target 99.99 percent DRE.

The required POHC feed rate for each test condition is determined by back-calculating from the stack sampling method detection limits and the target DRE (99.99 percent) using the following equation, which is derived from the DRE equation in 40 CFR § 266.104(a):

$$W_{in} = W_{out} \times \left[\frac{100}{100 - DRE} \right]$$

Table 6-7 provides the POHC quantity that will be required for the trial burn conditions.

Table 6-7
POHC (Toluene) Quantity

	Condition 1	Condition 2A	Condition 2B	Condition 3A	Condition 3B
Sampling method	VOST	VOST	VOST	VOST	VOST
Method detection limit	50 ng/20 L (70.80 ng/dscf)	50 ng/20 L (70.80 ng/dscf)	50 ng/20 L (70.80 ng/dscf)	50 ng/20 L (70.80 ng/dscf)	50 ng/20 L (70.80 ng/dscf)
Estimated stack flow rate	4,500 dscfm	54,000 dscfm	6,000 dscfm	62,000 dscfm	6,000 dscfm
Target DRE	99.99%	99.99%	99.99%	99.99%	99.99%
Emission rate required for detection	0.000042 lb/hr	0.00051 lb/hr	0.000056 lb/hr	0.00058 lb/hr	0.000056 lb/hr
Required POHC feed rate	0.42 lb/hr	5.1 lb/hr	0.56 lb/hr	5.8 lb/hr	0.56 lb/hr

6.6 Spiking of POHC

Spiking will be required to provide adequate quantities of toluene to demonstrate DRE. BASF will operate a toluene spiking system during the trial burn. The system will consist of a drum, a pump, a flow control valve, and a mass flow meter. The toluene will be pumped directly into a liquid waste feed lines, downstream of the flow monitors. The flow rates of the waste feed in the feed lines should be sufficient to provide mixing of toluene and liquid waste. Table 6-8 provides the toluene spiking rates for each of the trial burn conditions. These values were

chosen to provide an adequate safety factor above the calculated minimum required POHC feed rates given in Table 6-7.

Table 6-8
POHC (Toluene) Spiking Rates

Trial Burn Condition	Units	Toluene Spiking Rate
Condition 1	lb/hr	10
Condition 2A	lb/hr	60
Condition 2B	lb/hr	10
Condition 3A	lb/hr	60
Condition 3B	lb/hr	10

6.7 Spiking of Ash

BASF will demonstrate the maximum ash feed rate to each boiler during the trial burn. BASF plans to spike the liquid waste with a titanium dioxide dispersion. The system will consist of a drum, a pump, a flow control valve, and a mass flow meter. The ash material will be pumped directly into the waste feed line, adjacent to the POHC injection systems. The flow rates of the waste feed in the feed lines should be sufficient to provide mixing of the ash material and waste. The waste will be spiked with a titanium dioxide dispersion, consisting of titanium dioxide in ethylene glycol. The equivalent ash concentration of the dispersion is 20 percent by weight. Table 6-9 provides the titanium dioxide dispersion spiking rates for each of the trial burn conditions. These spiking rates may be adjusted prior to the testing to account for any ash present in the trial burn waste feeds.

Table 6-9
Ash Spiking Rates

Trial Burn Condition	Units	Titanium Dioxide Dispersion Spiking Rate	Equivalent Ash Spiking Rate
Condition 1	lb/hr	10	2.0
Condition 2A	lb/hr	125	25
Condition 2B	lb/hr	0	0
Condition 3A	lb/hr	125	25
Condition 3B	lb/hr	0	0

6.8 Spiking Systems Components and Configuration

B3 Systems will operate the spiking systems during the stack testing. The spiking systems will consist of the following major equipment:

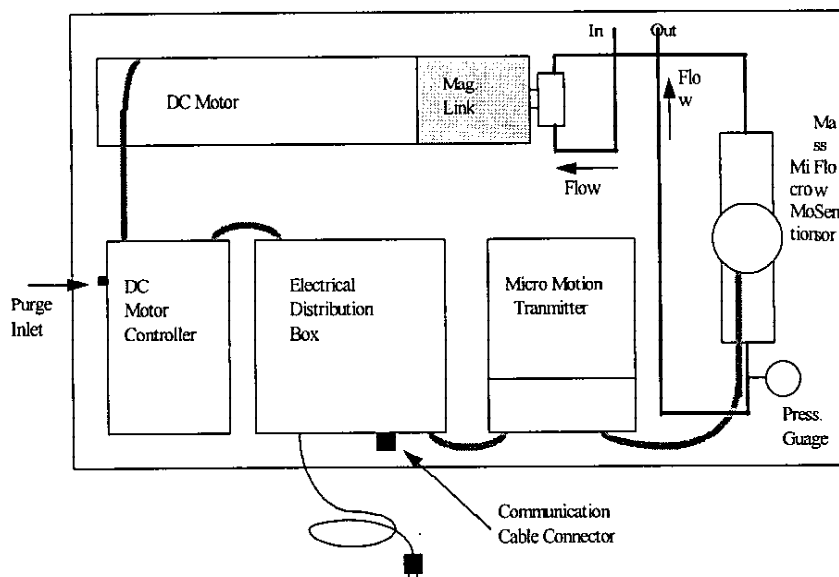
- Metering pumps;
- Mass flow meters; and
- Process control and data acquisition computer.

The spiking material is connected to the suction of the pump from the supply drum with flexible tubing. The pump transfers the fluid through the mass flow meter and into the waste feed line. The mass flow meter sends a signal to the process controller that will adjust the pump speed according to the set point. The data acquisition software will record the data continuously, providing a complete record of spiking rates. A schematic of a spiking system is provided in Figure 6-1.

During testing, spiking rates can be displayed in real-time trends. This allows the operator to monitor the system for problems on a real-time basis. In addition, the system provides continuous monitoring for fluid temperature, system pressure, fluid density, and motor output. All of this information provides quality control and quality assurance that the material is homogeneous and that the system is operating properly.

The system also allows for high and low alarms to be set around the set point. When these alarm values are exceeded, the operator is notified by an audible alarm. With the computer monitoring the flows, alarm levels and adjusting flow rates to the set point every second, human error is minimized, and more accurate data is obtained.

Figure 6-1
Spiking System Schematic



6.9 Test Materials and Quantities

Table 6-10 summarizes the quantity of materials required to conduct the testing. Triplicate runs will be carried out for each test condition. Each test run will require approximately four hours. Each condition will be performed over two days. An additional two hours of run time will be required for each day of testing in order to establish the steady state conditions before the start of the test runs, and one hour will be required between consecutive test runs. Therefore, for the purpose of calculating test quantities, a total of 17 hours has been used for each condition. We have also added approximately 20 percent to each total to allow for unforeseen delays.

Table 6-10
Test Material Quantities

	Condition 1	Condition 2A	Condition 2B	Condition 3A	Condition 3B
Liquid waste	20,400 lb	34,800 gal.	1,200 gal	10,300 gal	1,200 gal
Toluene	204 lb	1,224 lb	204 lb	1,224 lb	204 lb
Titanium dioxide dispersion	204 lb	2,550 lb	---	2,550 lb	---

6.10 Test Schedule

The sampling effort will require 11 days. During this period, sampling equipment and instruments will be prepared and calibrated, supplies will be brought on-site, and sampling locations will be prepared. The stack sampling contractor will move on site on the first day to set up for testing. Actual stack sampling for the conditions is expected to take 10 days.

The test conditions will each require three replicate test runs. Although the on-site activities will dictate the actual timing, a preliminary schedule is presented in Table 6-11. BASF may choose to run the test conditions in different order than presented in Table 6-11.

BASF has allowed one hour of run time in order to establish the steady state conditions before the start of the test runs. Steady state is defined as a condition when the combustion chamber temperatures and CO emissions remain stable with minimal fluctuation. BASF will use their extensive operating knowledge of the boilers to conservatively determine whether CO emissions and temperature values are experiencing more than minimal fluctuations. Operating experience has shown that after the adjustment of feed rates or operating conditions, steady-state condition can be achieved in less than one hour. For the purposes of the testing, we have increased the time to ensure the maximum stability of the system. The one-hour time period will begin when the liquid waste feed rate to the boilers has been established at the full test rate. If there is significant fluctuation at the end of the hour, the test will not begin until steady state conditions are achieved.

If an unplanned interruption occurs during a test run, BASF will allow time for the system to achieve steady-state prior to restarting the test run. If the interruption is less than one hour in duration, BASF will allow 15 minutes for the systems to re-establish steady-state. This 15-minute period will occur after the target operating conditions have been reestablished for the boiler. If the interruption is greater than one hour, BASF may allow additional time to establish steady-state. This time period will be dictated by the nature of the interruption and will be discussed with LDEQ and USEPA representatives onsite.

**Table 6-11
Test Schedule**

Day	Start	Stop	Activity
1	---	---	Set-up of sampling equipment for Amines Boiler and pre-test meetings
2	06:00	08:00	Begin feeding designated materials to Amines Boiler at Condition 1 rates and establish steady state operating conditions
2	08:00	12:00	Condition 1, Run 1
2	12:00	13:00	Set-up of sampling equipment for Run 2
2	13:00	17:00	Condition 1, Run 2
3	06:00	08:00	Begin feeding designated materials to Amines Boiler at Condition 1 rates and establish steady state operating conditions
3	08:00	12:00	Condition 1, Run 3
3	12:00	---	Set-up of sampling equipment for Utility Boiler No. 3
4	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 3 at Condition 2A rates and establish steady state operating conditions
4	08:00	12:00	Condition 2A, Run 1
4	12:00	13:00	Set-up of sampling equipment for Run 2
4	13:00	17:00	Condition 2A, Run 2
5	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 3 at Condition 2A rates and establish steady state operating conditions
5	08:00	12:00	Condition 2A, Run 3
6	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 3 at Condition 2B rates and establish steady state operating conditions
6	08:00	12:00	Condition 2B, Run 1
6	12:00	13:00	Set-up of sampling equipment for Run 2
6	13:00	17:00	Condition 2B, Run 2
7	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 3 at Condition 2B rates and establish steady state operating conditions
7	08:00	12:00	Condition 2B, Run 3
7	12:00	---	Set-up of sampling equipment for Utility Boiler No. 6
8	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 6 at Condition 3A rates and establish steady state operating conditions
8	08:00	12:00	Condition 3A, Run 1
8	12:00	13:00	Set-up of sampling equipment for Run 2
8	13:00	17:00	Condition 3A, Run 2

Table 6-11 (continued)
Test Schedule

Day	Start	Stop	Activity
9	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 6 at Condition 3A rates and establish steady state operating conditions
9	08:00	12:00	Condition 3A, Run 3
10	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 6 at Condition 3B rates and establish steady state operating conditions
10	08:00	12:00	Condition 3B, Run 1
10	12:00	13:00	Set-up of sampling equipment for Run 2
10	13:00	17:00	Condition 3B, Run 2
11	06:00	08:00	Begin feeding designated materials to Utility Boiler No. 6 at Condition 3B rates and establish steady state operating conditions
11	08:00	12:00	Condition 3B, Run 3
11	12:00	---	Break down sampling equipment



Section 7

Sampling and Analysis

Sampling and analysis performed during the test conditions described in Section 6 will demonstrate the performance of the boilers with respect to the applicable performance standards of RCRA. Each test condition will consist of three replicate test runs. For each run of each test condition, samples will be collected as noted in Sections 7.1 through 7.4, using procedures described in the QAPP found in Appendix A. The samples collected will be analyzed for the parameters discussed below. Table 7-1 provides an overview of the emissions demonstrations for each test condition.

Table 7-1
Emissions Demonstrations Overview

Emission Demonstration	Condition 1	Condition 2A	Condition 2B	Condition 3A	Condition 3B
Particulate matter	✓	✓		✓	
POHC (toluene)	✓	✓	✓	✓	✓
Carbon monoxide	✓	✓	✓	✓	✓
Hydrocarbons	✓	✓	✓	✓	✓

Liquid waste and stack gas samples will be collected during each test condition. This section of the Plan describes the sampling methods that will be employed. Since most of the proposed methods are standard reference methods, only brief descriptions are presented. Sample holding times will be consistent with the analytical requirements for the methods used. More detailed descriptions can be found in the indicated reference documents and in the QAPP.

7.1 Liquid Waste Sampling and Analysis

BASF personnel will collect the liquid waste samples from taps located in each feed line. The liquid waste sampling locations will be clearly labeled during the trial burn. The sample tap will be flushed initially (allowed to flow briefly) before the samples are collected.

At 30-minute intervals throughout each test run, approximately 250 milliliters (mL) of the liquid waste stream will be collected. The samples collected will be composited for each run into one-gallon jars. At the conclusion of each run, the sample will be mixed and four 500-mL aliquots will be poured into amber jars. The samples will be isolated from sources of

contamination during the sampling and compositing efforts. Two of the four samples will be used for analysis, and the remaining two samples will be archived.

Two 40-mL volatile organics analysis (VOA) sample vials will also be collected at 30-minute intervals during each test run. These samples will be composited in the laboratory prior to analysis. The cold samples will be emptied into a single narrow-mouth glass container for the composite and a single VOA will be filled from the composite. As is standard laboratory procedure, the time associated with making the composite will be minimized, thereby minimizing the potential for volatile loss.

The liquid waste samples will be analyzed to characterize the waste stream and collect information required to develop the operating limits. Higher heating value and specific gravity will be determined to characterize the waste stream. In addition, the liquid waste will be analyzed for the POHC (toluene) and for ash content. Table 7-2 summarizes the liquid waste samples to be taken, the parameters to be measured, and the frequency of measurement.

Table 7-2
Liquid Waste Sampling and Analytical Methods

Sampling Method	Sampling Frequency/ Duration	Analytical Parameter	Analytical Method ¹
Tap sampling Glass bottles	Every 30 minutes	Higher heating value	ASTM Method D240
		Specific gravity	ASTM Method D1298
		Ash content	ASTM Method D482
Tap sampling VOA vials	Every 30 minutes	POHC (toluene)	SW-846 Method 8260B

¹ ASTM refers to American Society for Testing and Materials.

SW-846 refers to *Test Methods for Evaluating Solid Waste, Third Edition*, November 1986, and Updates.

7.2 Spiking Material Sampling and Analysis

The toluene and titanium dioxide dispersion spiking material will not be sampled and analyzed during the test. These will be pure materials purchased for testing. Laboratory analysis by the suppliers will be used to determine the spiking liquids' composition.

7.3 Process Vent Sampling and Analysis

No process vents will be sampled during the trial burn. Process knowledge will be used to characterize the vent streams.

7.4 Stack Gas Sampling and Analysis

During the trial burn, the stack gas will be sampled for PM and toluene (POHC) emissions. CEMS will be used to monitor CO and oxygen in the stack gas. BASF also intend to monitor hydrocarbons (HC) during the trial burn. This demonstration is not required for the RCRA trial burn. However, BASF intends to collect this data for possible use as data in lieu of testing for future National Emission Standards for Hazardous Air Pollutants for Hazardous Waste Combustors (HWC NESHAP) compliance demonstrations.

The following sampling methods will be used during the trial burn:

- A combined USEPA Method 5 sampling train for measurement of PM emissions;
- An SW-846 (*Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates*) Method 0030 (Volatile Organic Sampling Train (VOST)) sampling train for measurement of toluene emissions (POHCs);
- USEPA Methods 3A, 25A, and 10 to monitor the concentrations of CO, HC, and oxygen in the stack gas.

Table 7-3 summarizes the stack gas samples to be taken, the parameters to be measured, and the frequency of measurement.

Table 7-3
Stack Gas Sampling and Analytical Methods

Sampling Method	Sampling Frequency/ Duration	Analytical Parameter	Analytical Method ¹
USEPA Method 5 ²	2 hours	Particulate matter	USEPA Method 5
SW-846 Method 0030 ³	4 tube sets, 40 minutes per tube set	Toluene	SW-846 Method 8260B
USEPA Methods 3A, 25A, and 10 ³	Continuous	Carbon monoxide, hydrocarbons, and oxygen	USEPA Methods 3A, 25A, and 10

¹ SW-846 refers to *Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates*. USEPA Method refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR Part 60.

² This method will be performed for Conditions 1, 2A, and 3A.

³ This method will be performed for Conditions 1, 2A, 2B, 3A, and 3B.



Section 8

Trial Burn Report

The Trial Burn Report will be submitted to LDEQ and USEPA within 90 days of completing the testing. The Trial Burn Report will be based on the report format specified in the LDEQ's *Guidance For Organization, Content, and Format, Trial Burn Report* (LDEQ, December 2003). The report will use the following basic outline:

- 1.0 Summary of Test Results
- 2.0 Introduction/Process Description
- 3.0 Operating Data Summary Target Operating Conditions
- 4.0 Feedstream Sampling and Analysis
- 5.0 RCRA Emissions and Performance Results
- 6.0 Quality Assurance/Quality Control Documentation
- 7.0 Proposed Permit Limits
- 8.0 List of Continuing Compliance Methods

Appendix A - Stack Sampling Report

Appendix B - Feedstream Sampling Report

Appendix C - Quality Assurance Report

Appendix D - Operating Data Report

Appendix E - Field Logs

Appendix F - Analytical Data Packages

Appendix G - Resumes



Appendix A

Quality Assurance Project Plan

527 Plymouth Road, Suite 406
Plymouth Meeting, PA 19462
Telephone (610) 834-0490
Fax (610) 834-1469

Quality Assurance Project Plan for Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6

BASF Corporation

Geismar, Louisiana

September 2006



Signature Page

Facility: BASF Corporation (BASF), Geismar, Louisiana
Unit ID: Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6
Test Title: Trial Burn

This Quality Assurance Project Plan (QAPP) has been developed for the trial burn to be conducted for BASF's Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6. This QAPP has been distributed to and read by the signatories. By signing, the signatories agree to the appropriate information pertaining to their project responsibilities provided in the QAPP.

Dana M. Scott
BASF Corporation
Test Burn Manager

Date

Dr. Robert Adams
METCO Environmental
Quality Assurance Officer

Date

S. Heather McHale, P.E.
RMT, Inc.
Project Coordinator

Date

Blair Shields
METCO Environmental
Project Director

Date



Signature Page

Facility: BASF Corporation (BASF), Geismar, Louisiana
Unit ID: Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6
Test Title: Trial Burn

This Quality Assurance Project Plan (QAPP) has been developed for the trial burn to be conducted for BASF's Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6. This QAPP has been distributed to and read by the signatories. By signing, the signatories agree to the appropriate information pertaining to their project responsibilities provided in the QAPP. Laboratory representatives have reviewed the methods and Louisiana Environmental Laboratory Accreditation Program (LELAP) approved laboratory standard operating procedures (SOPs) specified in the QAPP and certify that all methods will be performed in accordance with these requirements and any deviations will be noted.

Kevin Woodcock
Project Manager
Severn Trent Laboratories
5815 Middlebrook Pike
Knoxville, TN 37921

Date



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Attachment 2	Contractor Contact Information
Attachment 3	Project Team Resumes
Attachment 4	Example Waste Feed Sampling Form
Attachment 5	B3 Standard Operating Procedure for Calibration Checks



Section 1

Introduction

This Quality Assurance Project Plan (QAPP) is being submitted by BASF Corporation (BASF) for three hazardous waste-fired boilers located at BASF's Geismar, Louisiana, facility. The boilers, henceforth identified as Amines Boiler, Utility Boiler No. 3, and Utility Boiler No. 6, are subject to the Resource Conservation and Recovery Act (RCRA) Boiler and Industrial Furnace (BIF) standards codified in Title 40 Code of Federal Regulations (CFR) Part 266 Subpart H and Louisiana Code (LAC) Title 33, Part V, Subpart 1, Chapter 30. BASF intends to conduct a trial burn to demonstrate compliance with RCRA performance standards. This QAPP describes the quality assurance and quality control (QA/QC) program associated with the trial burn.

1.1 Facility Overview

The BASF facility is located adjacent to the Mississippi River on over 2,000 acres, most of which is located to the southwest of State Highway 30. The plant is approximately two kilometers (km) southeast of Geismar, Louisiana, and 19 km south of Baton Rouge, Louisiana. The facility is surrounded by land used primarily for industrial and agricultural purposes. The facility produces various chemical products and intermediates.

The street address of the BASF Geismar facility is:

BASF Corporation
8404 River Road
Geismar, Louisiana 70734

All correspondence should be directed to the facility contact at the following address and telephone number:

Dana M. Scott
EHS LA Hub Team Member
BASF Corporation
P.O. Box 457
Geismar, Louisiana 70734-0457
(225) 339-2570

BASF operates three boilers that burn hazardous waste. The boilers burn waste liquid fuels and off gases from the various production processes at the Geismar facility.

1.2 Trial Burn Summary

The trial burn has been designed to demonstrate compliance with the RCRA PM and DRE performance standards. The program consists of one test condition for the Amines Boiler and two test conditions each for Utility Boiler No. 3 and Utility Boiler No. 6. Table 1-1 summarizes the trial burn demonstrations for each boiler.

**Table 1-1
Trial Burn Condition Summary**

Boiler	Test Condition	Performance Standard Demonstration	Operating Limits Established
Amines Boiler	1	Particulate matter Destruction and removal efficiency	Maximum ash feed rate
			Maximum stack gas flow rate
Utility Boiler No. 3	2A	Particulate matter Destruction and removal efficiency	Maximum ash feed rate
			Maximum total hazardous waste feed rate
			Maximum stack gas flow rate
	2B	Destruction and removal efficiency	Minimum combustion chamber temperature
Utility Boiler No. 6	3A	Particulate matter Destruction and removal efficiency	Maximum ash feed rate
			Maximum stack gas flow rate
	3B	Destruction and removal efficiency	Minimum combustion chamber temperature

This trial burn is being coordinated by RMT, Inc. (RMT) under the direction of BASF personnel. RMT is responsible for the test protocol development and implementation and will oversee boiler operations and the stack sampling activities during the test program. METCO Environmental (METCO) will perform all of the stack sampling for the test program. METCO will be responsible for all emissions and process samples collected during the test program, with oversight by RMT. B3 Systems will provide waste spiking services during the test program. The emissions and process samples will be sent to the following laboratories for analysis: METCO and Severn Trent Laboratories, Inc. (STL). Dr. Robert Adams of METCO will act as the Quality Assurance Officer and will provide oversight of the stack sampling contractor during the testing.

1.3 Laboratory Subcontractors

STL's facility in Knoxville, Tennessee will be the subcontractor laboratory. Laboratory contact information is provided in Attachment 1. The point of contact for STL is Mr. Kevin Woodcock.

The QAPP has been submitted to the laboratory for their review and understanding of their project responsibilities.

1.4 Quality Assurance Project Plan Organization

This QAPP has been prepared following the USEPA document entitled *Preparation Aids for the Development of Category 1 Quality Assurance Project Plan* (USEPA, February 1991). The QAPP will serve as an essential guidance by which the trial burn will be performed. The QAPP defines all aspects of QA/QC procedures and establishes sampling and analytical quality indicators that will demonstrate achievement of the test objectives. Additionally, this QAPP defines precision and accuracy criteria for all of the required measurements that will be used to demonstrate that all associated test data is of sufficient quality to demonstrate compliance. The remaining sections of the QAPP provide the following information:

- Section 2 presents information on the trial burn project team;
- Section 3 describes the trial burn sampling procedures;
- Section 4 presents sample handling and documentation information;
- Section 5 discusses analytical procedures;
- Section 6 presents the trial burn data quality objectives;
- Section 7 discusses calibration procedures and preventative maintenance;
- Section 8 discusses data reduction, validation and reporting procedures;
- Section 9 discusses quality assurance reports;
- Section 10 includes a list of reference documents for the QAPP;
- Attachment 1 includes laboratory contact information;
- Attachment 2 includes contractor contact information;
- Attachment 3 includes project team resumes;
- Attachment 4 includes an example waste feed sampling form; and
- Attachment 5 includes B3 Systems' standard operating procedure (SOP) for calibration checks.



Section 2

Organization of Personnel, Responsibilities, and Qualifications

BASF, METCO, B3 Systems, the subcontracted laboratory, and RMT have specific unique duties in the implementation of the trial burn project. The project organization is shown in Figure 2-1. Key personnel contact information is summarized in Attachment 2. Resumes for key project team members are provided in Attachment 3. Any key personnel that become unavailable will be replaced by equally qualified personnel prior to test mobilization. The project team duties are summarized as follows.

BASF, through the Test Burn Manager, will:

- Report all feed rates and boiler process parameters;
- Operate the boilers;
- Procure and prepare waste feeds; and
- Collect waste samples.

RMT, through the Project Coordinator, will:

- Serve as liaison with regulatory agencies and the trial burn team;
- Provide oversight for the project; and
- Prepare the final summary report.

METCO, through the Project Director, will:

- Perform stack gas sampling;
- Implement the quality assurance (QA) program for the emissions testing and sample analysis;
- Provide custody of all samples generated by the test efforts;
- Transport the samples to the laboratories for analysis; and
- Prepare the stack and process sampling report and supporting documentation.

B3 Systems, through the spiking crew, will:

- Perform spiking of toluene;

- Perform spiking of ash; and
- Provide a spiking data report.

The subcontracted laboratory will:

- Perform sample analyses;
- Perform method and QAPP specified QA/QC;
- Provide a detailed Case Narrative; and
- Generate an analytical data report in a CLP-like format, as appropriate.

The Quality Assurance Officer will:

- Oversee sampling and analysis procedures;
- Provide input and document the observation of testing and corrective actions; and
- Review all analytical results.

2.1 BASF Test Burn Manager

Dana M. Scott will serve as the BASF Test Burn Manager. Ms. Scott will be responsible for directing BASF personnel in the operations of the boilers during the testing. She will also ensure that all necessary boiler operating data is collected during the test.

2.2 RMT Project Coordinator

Heather McHale of RMT will provide coordination and oversight during the test program. She will ensure that all test team members communicate throughout the test program and that the objectives of the Trial Burn Plan are met.

2.3 METCO Project Director

Blair Shields of METCO will serve as the Project Director for the trial burn. He will be responsible for technical supervision of the project, data interpretation, and overall report preparation. He will coordinate with all laboratories and outside service providers. He will be the main contact for all laboratories and the trial burn project team.

2.4 METCO Field Testing Supervisor

Jervey Cheveallier will serve as the Field Testing Supervisor. He will oversee the METCO field crew during the testing. He will be responsible for all aspects of sample collection and will report any deviations immediately to the Test Burn Manager and Project Coordinator.

Mr. Cheveallier is also a Certified Shipper and will be responsible for shipment of all samples to the laboratories. The samples will be packaged according to Department of Transportation (DOT) and International Air Transport Association (IATA) regulations. The majority of the samples will be transported to the laboratories by Federal Express.

2.5 Field Team

The Field Team will be made up of BASF and METCO personnel. BASF operators will be responsible for collecting all process samples. METCO will take custody of the samples from the operators at the conclusion of the testing. All stack gas samples will be collected by METCO personnel, under the supervision of the Field Testing Supervisor.

2.6 B3 Systems Task Leader

Dan Ealy will serve as the off-site Program Manager for B3 Systems. B3 Systems was founded in 1991 and has extensive experience in the spiking of inorganic and organic compounds. Mr. Ealy will ensure that the spiking crew is staffed with experienced technicians.

2.7 Quality Assurance Officer

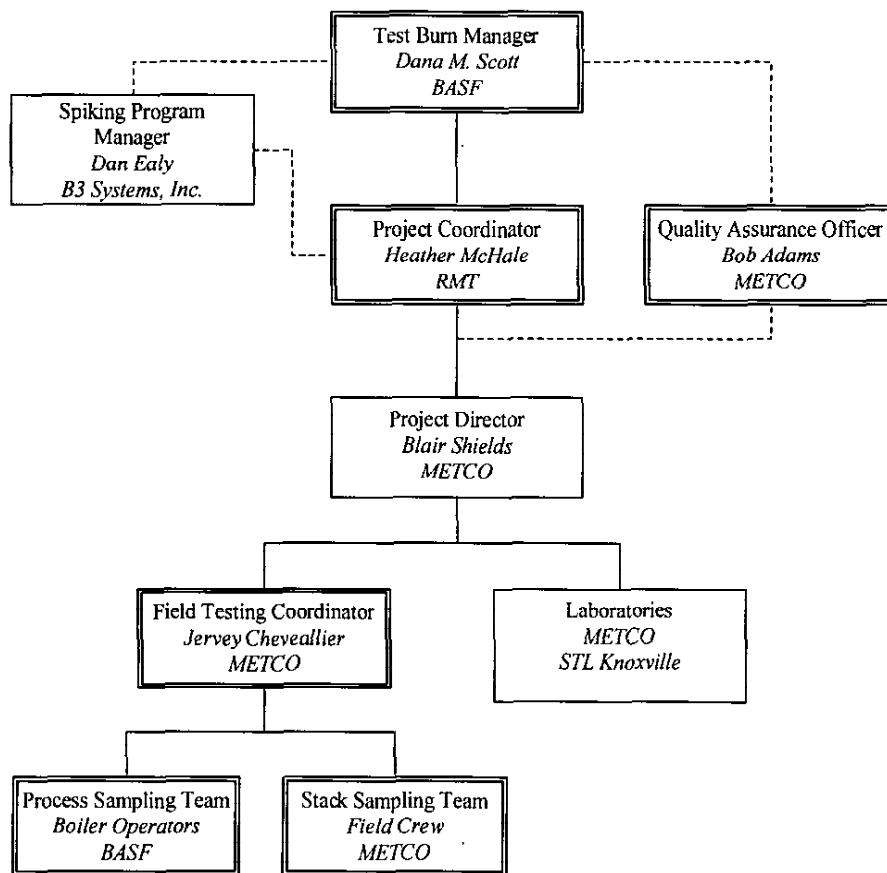
The Quality Assurance Officer will have overall QA authority for all aspects of the trial burn. The Quality Assurance Officer is organizationally independent of the trial burn technical staff and is not directly responsible for making any measurements during the test. Dr. Robert Adams of METCO has been selected as the Quality Assurance Officer.

Specifically the Quality Assurance Officer is responsible for the following:

- Resolving any potential conflicts with laboratories conducting the analyses and communicating all changes to the Field Testing Supervisor prior to the actual stack testing;
- Coordinating with the Test Burn Manager, the Project Coordinator, and agency personnel on-site to resolve any conflicts during the testing;
- Providing laboratory communications oversight prior to, during, and after the sampling activities take place;
- Providing documentation of all laboratory communications for the duration of the project to ensure that potential QA/QC issues encountered during sample collection, analysis and data validation are accounted for in the assessment of data usability;
- Providing additional oversight for sampling activities during the testing;
- Providing oversight for sample handling, shipment and laboratory receipt, after the samples have been taken;

- Providing final data validation through a review of all laboratory reports for data quality issues, including review of case narratives for acceptability; and
- Providing a QA summary report that includes a listing of all deviations from the Trial Burn Plan or QAPP with corrective actions and the affect on data quality.

Figure 2-1
Project Organization



— Lines of Responsibility
 - - - Lines of Communication
 Double lines indicate
 on-site responsibilities
 during testing.



Section 3

Sampling Procedures

This section provides descriptions of the process and stack sampling procedures to be performed during the trial burn.

3.1 Waste Sampling

BASF personnel will collect the liquid waste samples from taps located in each feed line. The liquid waste sampling locations will be clearly labeled during the trial burn. The sample tap will be flushed initially (allowed to flow briefly) before the samples are collected.

At 30-minute intervals throughout each test run, approximately 250 milliliters (mL) of the liquid waste stream will be collected. The samples collected will be composited for each run into one-gallon jars. At the conclusion of each run, the sample will be mixed and four 500-mL aliquots will be poured into amber jars. The samples will be isolated from sources of contamination during the sampling and compositing efforts. Two of the four samples will be used for analysis, and the remaining two samples will be archived.

Two 40-mL volatile organics analysis (VOA) sample vials will also be collected at 30-minute intervals during each test run. These samples will be composited in the laboratory prior to analysis. The cold samples will be emptied into a single narrow-mouth glass container for the composite and a single VOA will be filled from the composite. As is standard laboratory procedure, the time associated with making the composite will be minimized, thereby minimizing the potential for volatile loss.

An example waste feed sampling form can be found in Attachment 4.

3.2 Spiking Material Sampling

The toluene and titanium dioxide dispersion spiking material will not be sampled and analyzed during the test. These will be pure materials purchased for testing. Laboratory analysis by the suppliers will be used to determine the spiking liquids' composition.

3.3 Process Vent Sampling

No process vents will be sampled during the trial burn. Process knowledge will be used to characterize the vent streams.

3.4 Stack Gas Sampling

The stack gas sampling will follow the methods documented in 40 CFR Part 60, Appendix A (USEPA Methods) and *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (USEPA, April 1998 and updates) (SW-846). Any modifications to prescribed USEPA or SW-846 test methods will be outlined in the sampling procedure descriptions below. Pretest and post-test leak checks will be performed for each sampling train, as required by the respective test methods. Leak checks will also be performed at port changes. All sampling trains will be assembled and recovered in a mobile laboratory to ensure a clean environment. Table 3-1 summarizes the sampling procedures to be used during the trial burn for collection of stack gas samples.

Table 3-1
Stack Gas Sampling Summary

Condition	Parameter	Sampling Method	Sample Fraction
1, 2A, 2B, 3A, 3B	Gas flow rate, composition, and moisture content	USEPA Methods 1-4	Not applicable
1, 2A, 3A	Particulate matter	USEPA Method 5	Filter
			Front-half acetone rinse
1, 2A, 2B, 3A, 3B	Toluene	SW-846 Method 0030	Tenax™ resin
			Tenax™ resin/charcoal
			Condensate

3.4.1 Sampling Point Determination – USEPA Method 1

The number and location of the gas sampling points will be determined according to the procedures outlined in USEPA Method 1. Verification of absence of cyclonic flow will be conducted prior to testing by following the procedure described in USEPA Method 1. The cyclonic flow check will be performed once for each stack during the trial burn.

A stack diagram for the Amines Boiler is provided as Figure 3-1. For the USEPA Method 5 sampling train, six points will be sampled from each of two ports for a total of twelve sampling points.

A stack diagram for Utility Boiler No. 3 is provided as Figure 3-2. For the USEPA Method 5 sampling train, five points will be sampled from each of five ports for a total of 25 sampling points.

A stack diagram for the Utility Boiler No. 6 is provided as Figure 3-3. For the USEPA Method 5 sampling train, 12 points will be sampled from each of two ports for a total of 24 sampling points.

3.4.2 Flue Gas Velocity and Volumetric Flow Rate – USEPA Method 2

The flue gas velocity and volumetric flow rate will be determined according to the procedures outlined in USEPA Method 2. Velocity measurements will be made using Type S pitot tubes conforming to the geometric specifications outlined in USEPA Method 2. Differential pressures will be measured with fluid manometers. Effluent gas temperatures will be measured with thermocouples equipped with digital readouts.

3.4.3 Flue Gas Composition and Molecular Weight – USEPA Method 3

The composition of the bulk gas and the gas molecular weight at the stack (concentration of carbon dioxide and oxygen) will be determined by USEPA Method 3. An integrated sample of gas will be extracted throughout each run and collected in a Tedlar bag for each run. The sample will be analyzed for carbon dioxide and oxygen using an Orsat analyzer. The calculated molecular weight will be used for all isokinetic calculations.

3.4.4 Flue Gas Moisture Content – USEPA Method 4

The flue gas moisture content will be determined in conjunction with each USEPA Method 5 sampling train according to the sampling and analytical procedures outlined in USEPA Method 4. The impingers will be connected in series and will contain reagents as described for each sampling method. The impingers will be housed in an ice bath to assure condensation of the moisture from the flue gas stream. Any moisture that is not condensed in the impingers is captured in the silica gel. Moisture content is determined by weighing the various sample fractions.

3.4.5 Particulate Matter Emissions – USEPA Method 5

The sampling and analytical procedures outlined in USEPA Method 5 will be used to determine particulate matter in the stack gas during Conditions 1, 2A, and 3A. The sampling train will consist of a glass/quartz fiber filter, two impingers each containing 100 mL of de-ionized water, an empty impinger, and an impinger containing at least 250 grams of silica gel.

All sampling train components will be constructed of materials specified in the method and will be cleaned and prepared per method specifications prior to testing. A minimum sample volume of 45 dry standard cubic feet (dscf) will be collected over a

minimum of 120 minutes. The probe and filter temperatures will be maintained between 223 degrees Fahrenheit (°F) and 273°F. The sampling runs will be performed within ± 10 percent of isokinetic conditions.

Sample recovery procedures will follow those outlined in the test method. Recovery of the USEPA Method 5 sampling train will result in two sample fractions. Sample fractions are listed in Table 3-1. The filter fraction will be packaged in a Petri dish for shipment. The rinse fraction will be collected in a glass jar and returned to METCO's laboratory for analysis. Impinger contents will be measured gravimetrically to determine moisture content and will be archived.

A field blank will be recovered at the end of the testing program along with blanks of each reagent used at the test site.

A diagram of the sample system is presented as Figure 3-4.

3.4.6 Toluene Emissions – SW-846 Method 0030

SW-846 Method 0030 Volatile Organic Sampling Train (VOST) will be used to sample stack emissions for determination of the chosen principle organic hazardous constituent (POHC) – toluene – during Conditions 1, 2A, 2B, 3A, and 3B.

The VOST system draws effluent stack gas through a series of sorbent traps. The first trap will contain Tenax™ resin, and the second will contain a section of Tenax™ followed by a section of activated charcoal. A water-cooled condenser will be arranged so that condensate will drain vertically through the traps. New Teflon sample transfer lines will be used, and the sampling train will use greaseless fittings and connectors. The Tenax™ resin will be cleaned and tested prior to testing according to the QA requirements of the method.

Sampling will take place for 160 minutes per test run. Sampled gas will be passed through each pair of traps for 40 minutes. Four pairs of traps will be collected per run. One sample of condensate will be collected per VOST sampling run (four pairs). Three of the four pairs of VOST tubes will be analyzed for each run. The fourth will be archived and analyzed if any of the other three tube sets cannot be analyzed. The VOST probe will be kept at or above 130 degrees Celsius (°C) during sampling. The VOST will be operated at a sampling rate of approximately 0.5 liters per minute (L/min) for a total of 20 L per sample.

Each pair of traps will be analyzed separately to measure VOST breakthrough. Breakthrough is present if the catch on the second tube exceeds 30 percent of the catch on the first tube and is above 75 nanograms (ng).

Extra sorbent cartridges will be taken to the sampling site to serve as field and trip blanks. One pair of VOST tubes, designated as a field blank, will be exposed to the ambient air at the sampling location. The exposure time will correspond to the amount of time required to load and unload a pair of VOST tubes onto the sampling train. The tubes will be collected and recovered for each run.

A diagram of the sample system is presented in Figure 3-5.

3.5 Sampling Quality Control Procedures

Specific sampling QC procedures will be followed to ensure the production of useful and valid data throughout the course of this test program.

Prior to the start of testing, all sampling equipment will be thoroughly checked to ensure clean and operable components and ensure that no damage occurred during shipping. Once the equipment has been set up, the manometer used to measure pressure across the pitot tube will be leveled and zeroed and the number and location of all sampling traverse points will be checked.

To ensure that the sampling trains are free of contamination, all glassware will remain sealed until assembly of the sampling train. The trains will be assembled in a clean environment, free of uncontrolled dust.

At the start of each test day and throughout the testing, all sample train components will be checked to ensure they remain in good condition and continue to operate properly. Electrical components will be checked for damaged wiring or bad connections. All glassware will be inspected to make sure no cracks or chips are present. Care will be taken to make sure that all sampling trains are being operated within the specifications of their respective method. At the end of testing each day, all sampling equipment will be sealed and covered to protect from possible contamination and weather damage.

Figure 3-1
Amines Boiler Stack Diagram

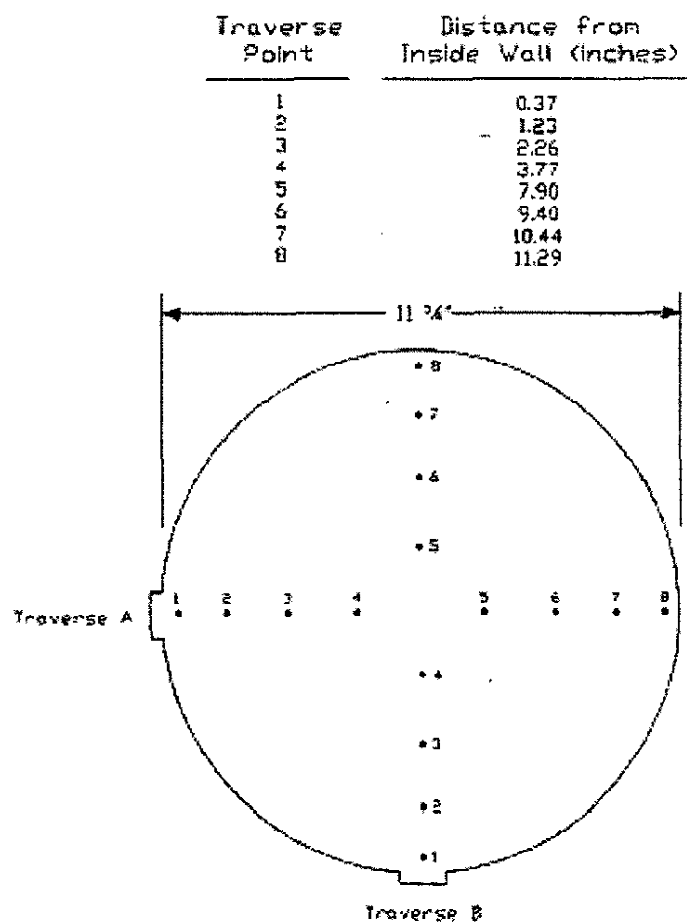


Figure 3-2
Utility Boiler No. 3 Stack Diagram

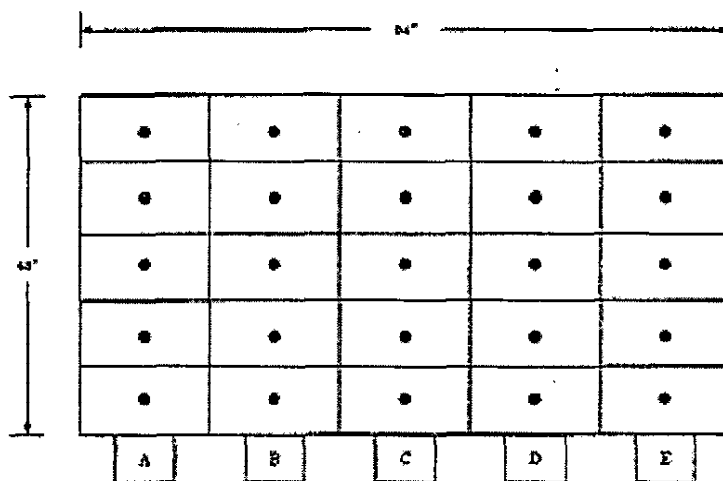


Figure 3-3
Utility Boiler No. 6 Stack Diagram

Traverse Point	Distance From Inside Wall (inches)
1	2.02
2	5.43
3	11.33
4	15.99
5	24.00
6	34.16
7	61.82
8	72.00
9	79.01
10	84.67
11	89.57
12	93.98

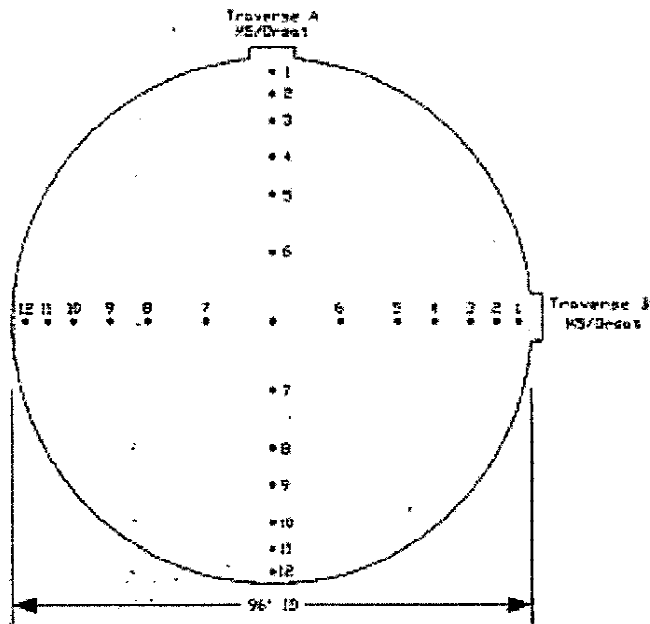


Figure 3-4
USEPA Method 5 Sampling Train

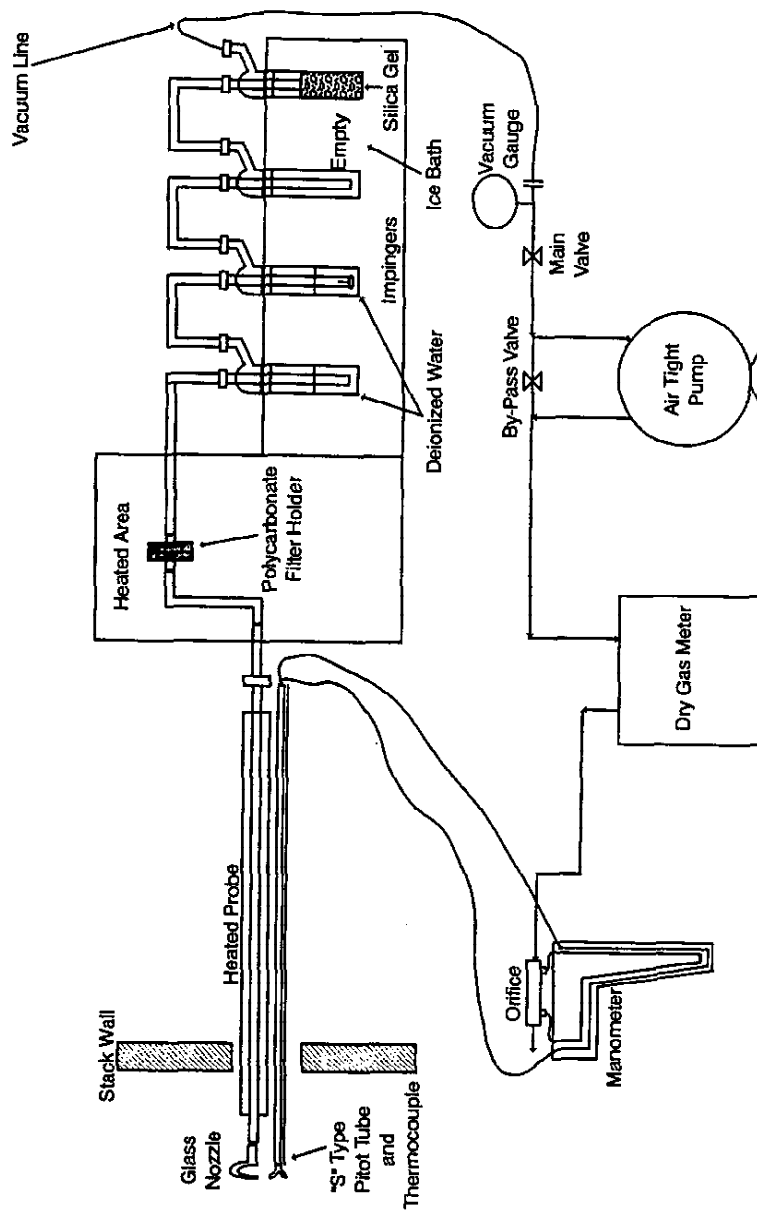
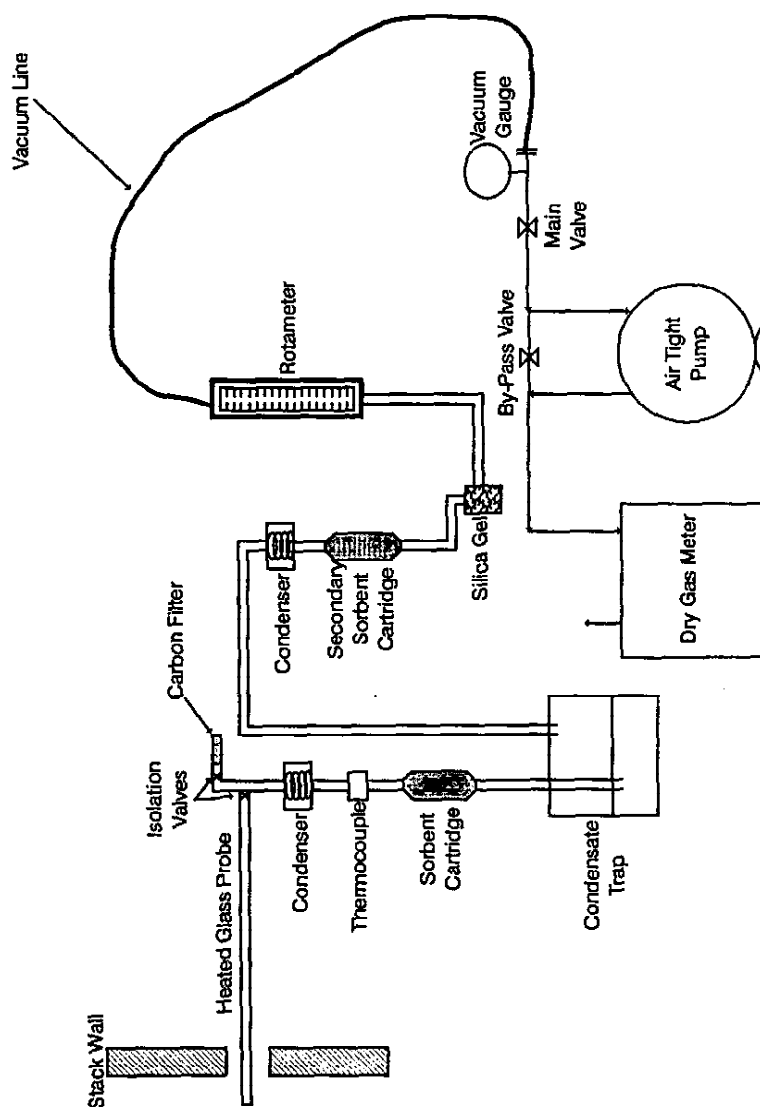


Figure 3-5
SW-846 Method 0030 Sampling Train





Section 4

Sample Handling and Documentation

Sample custody procedures for this program are based on procedures from the *Handbook: QA/QC Procedures for Hazardous Waste Incineration* (USEPA, 1990) (QA/QC Handbook) and SW-846, Chapter 1. The procedures that will be used are discussed below.

4.1 Field Sampling Operations

METCO will be responsible for ensuring that custody and sample tracking documentation procedures are followed for the field sampling and field analytical efforts. Documentation of all sample collection activities will be recorded on METCO's data collection forms. Table 4-1 provides a summary of sample custody documentation requirements.

Table 4-1
Sample Custody Documentation Requirements

Custody Document	Required Information
Sample ID log	List of all samples taken
	Time and date of sampling
	Description of sample
	Unique identifier for each sample
Sample data forms	Sampler's name
	Date and time of sample collection
	Sampling technique
	Compositing technique (waste samples)
	Sample identifier
	Sampling location
Chain of custody	Identifier of every sample shipped
	Sample preservation requirements
	Analysis and preparation procedures requested
	Signature of individual relinquishing sample custody

Upon receipt by the laboratory, information pertaining to the samples will be recorded on the sample tracking and custody form or an attachment to the form. The laboratory will note the

overall condition of the samples, including the temperature of the samples upon receipt. The laboratory will also note any discrepancy in sample ID between the sample labels and the custody forms provided. The signature of the person receiving the samples will be provided on the chain of custody (COC).

Every record pertaining to sample collection activities, including, but not limited to, stack sampling data sheets, process sample data sheets, sample tracking forms, sample identification log, sampling equipment calibration forms, balance calibration forms, and reagent preparation will be submitted with the report to provide evidence that the samples were handled properly, taken at the correct time and in the correct manner, assigned a unique identifier, received intact by the laboratory, and preserved as appropriate. Adherence to the holding times indicated in Section 5, Tables 5-1 and 5-2, will be noted in the laboratory analytical results.

Samples will be collected, transported, and stored in clean containers that are constructed of materials inert to the analytical matrix, such as glass jars. Only containers that allow airtight seals will be used. Amber glass will be employed when specified by the method.

Stack sampling data, including information regarding sampling times, locations, and any specific considerations associated with sample acquisition will be recorded on preformatted data sheets.

The sample ID log will be completed in advance. Unique sample identification numbers will be recorded on each sample bottle label, in the sample identification log, and on the sample tracking forms.

Waste feed and process samples that are collected will be packed by METCO for transfer or shipment to the appropriate laboratories. Sample tracking and custody forms, which include sample identification and analysis requests, will be enclosed in the sample shipment container.

4.2 Field Laboratory Operations

METCO will provide an on-site laboratory trailer for sample train assembly and recovery and documentation and recordkeeping activities. Sample tracking documentation, shipping records, reagent and standards traceability, and all sampling activity records will be maintained in the laboratory trailer.

Documentation of on-site analysis activities, such as calibration, standards traceability, sample preparation steps, and raw measurement results will also be maintained on site.



Section 5

Analytical Procedures

The analytical methods to be used during this test effort are detailed in Tables 5-1 and 5-2. Table 5-1 presents the analytical methods for waste samples. Table 5-2 presents the analytical methods for stack gas samples. These tables present the referenced analytical method, the laboratory performing the analysis, the extraction and analysis holding time, and if required, the sample preservation and sample preparation method. Collection of these samples is described in Section 3. Note that the tables in Section 3 specify which samples are to be collected using which methods. The tables included in this section specify the preparation and analytical methods to be used to evaluate each sample.

Table 5-1
Sample Preparation and Analysis Procedures for Waste Samples

Parameter	Analytical Method	Lab	Preservative Required	Extraction Holding Time (days)	Analysis Holding Time (days)	Preparation Method
Higher heating value	ASTM Method D240	STL	NA ¹	NA	180	NA
Specific gravity	ASTM Method D1298	STL	NA	NA	180	NA
Ash	ASTM Method D482	STL	NA	NA	180	NA
Toluene (POHC)	SW-846 Method 8260B	STL	Ice	NA	14	SW-846 Method 5030B

¹ Not applicable.

Table 5-2
Sample Preparation and Analysis Procedures for Stack Gas Samples

Parameter	Analytical Method	Lab	Preservative Required	Extraction Holding Time (days)	Analysis Holding Time (days)	Preparation Method
Molecular weight	USEPA Method 3	NA ¹	NA	NA	NA	NA
Moisture	USEPA Method 4	NA	NA	NA	NA	NA
Particulate matter	USEPA Method 5	METCO	NA	NA	40	USEPA Method 5
Toluene (POHC)	SW-846 Method 8260B	STL	Ice	NA	14	SW-846 Method 5041A

¹ Not applicable.



Section 6

Data Quality Objectives

The purpose of this trial burn is to demonstrate compliance with the RCRA performance standards. BASF is committed to ensuring that the data generated during this project are scientifically valid, defensible, complete, and of known precision and accuracy. These objectives can be best achieved by applying the requirements of USEPA-accepted methodology as well as the more specific recommendations and guidelines specific to test burns. To ensure the consistency and adequacy of plans, reports, and overall data quality, guidance from the following documents have been integrated into the approaches and philosophies in this QAPP:

- SW-846, Chapter One; and
- QA/QC Handbook.

Although the QA/QC procedures included in the QA/QC Handbook lack the statistical approach in establishing acceptance criteria for the specified methodology, this document does provide specific guidance for test burns. It is important that these objectives be defined in terms of project requirements, not in terms of the capabilities of the test methods used, per se. In this context, QA objectives should not only be attainable by the chosen methods of sampling, sample preparation, and analysis, but should indicate the quality necessary to draw valid conclusions regarding the achievement of the objectives of the program, such as provided in the QA/QC Handbook. Key measures of successful achievement, which apply to all environmental measurement programs, include the objectives for precision, accuracy, representativeness, completeness, and comparability (commonly referred to as PARCC parameters).

This section presents project-specific data quality objectives for this trial burn. These objectives represent the level of data quality that would be considered acceptable for valid decision-making, as measured in a manner that best reflects performance in the actual project matrices.

6.1 Quality Control Parameters

Quality control (QC) parameters include precision, accuracy, representativeness, comparability, and completeness. Typical QC parameters include matrix spikes (MSs), matrix spike duplicates (MSDs), laboratory control samples (LCSs), laboratory control sample duplicates (LCSDs), surrogates standards, spikes, and duplicates. Tables 6-1 and 6-2 provide the project specific QC procedures for assessing accuracy and precision measurements for critical measurement parameters. Critical parameters are those that directly relate to the demonstration of regulatory

compliance. These tables list the parameter of analysis, QC parameter, QC procedure, frequency at which accuracy and precision are determined, and the QC objective.

Table 6-1
Quality Control Objectives for Waste Feed Samples

Analytical Parameters	QC Parameter	QC Procedure	Frequency	Objective ¹
Higher heating value	Precision	Field duplicate	1 per trial burn	<20% RPD ³
Specific gravity	Precision	Field duplicate	1 per trial burn	<20% RPD
Ash	Precision	Field duplicate	1 per trial burn	<20% RPD
Toluene (POHC)	Accuracy	Surrogates	Every sample	50-130% recovery
	Accuracy	MS ²	1 per condition	50-130% recovery
	Precision	Surrogate	Calculate RSD for each condition	<35% RSD of recovery
	Precision	MSD ²	1 per condition	< 50% RPD ³
	Precision	Field duplicate	1 per trial burn	<20% RPD ³

¹ RPD refers to relative percent difference. RSD refers to relative standard deviation.

² MSs are not applicable on samples with greater than 0.1% of the target analyte.

³ If the concentrations are less than five times the reporting limit, the laboratory will be unable to control these limits.

Table 6-2
Quality Control Objectives for Stack Gas Samples

Analytical Parameters	QC Parameter	QC Procedure	Frequency	Objective
Toluene (POHC)	Accuracy	LCS	Per batch	50-150% recovery
	Accuracy	Surrogates	All samples	50-150% recovery
	Precision	LCSD	Per batch	≤ 25% RPD

6.1.1 Precision

Precision is a measure of the reproducibility of results under a given set of conditions. It is expressed in terms of the distribution, or scatter, of replicate measurement results, calculated as the relative standard deviation (RSD) or, for duplicates, as relative percent difference (RPD). RPD and RSD values are calculated using the following equations:

$$RPD = \left(\frac{|X_1 - X_2|}{\text{avg. } X} \right) \times 100$$

$$RSD = \left(\frac{\text{STDDEV}}{\text{avg. } X} \right) \times 100$$

Where X_1 and X_2 represent each of the duplicate results.

6.1.2 Accuracy

Accuracy is a measure of the difference between an analysis result and the "true" value. Accuracy is expressed in terms of percent recovery (e.g., for surrogates, spikes, and reference material) and is calculated using the equation below:

$$\% \text{ Recovery} = \left(\frac{\text{SSR} - \text{SR}}{\text{SA}} \right) \times 100$$

Where: SSR = Spiked Sample Result

SR = Sample Result

SA = Spike Added

6.1.3 Representativeness

Representativeness is defined as the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, process condition, or an environmental condition. An appropriate sampling strategy that addresses collection of representative samples in time and space is crucial to subsequent decision-making and defensibility of the data. There are no numerical objectives for representativeness. The selection of suitable locations and sampling strategies, as described in this QAPP, and adherence to sample collection protocols, are the bases for ensuring representativeness.

6.1.4 Comparability

Comparability is defined as expressing the confidence with which one data set can be compared to another. There are no numerical objectives for comparability. A representative sample whose results are comparable to other data sets is ensured primarily through the use of standard reference sampling and analytical methods. Reported in common units, the results generated should thus be comparable to those obtained from other emissions tests and allow for consistent decision-making.

6.1.5 Completeness

Completeness is defined as the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under optimal normal conditions. Completeness can be defined quantitatively using the equation below:

$$\% \text{Completeness} = \left(\frac{\text{No. of Valid Data}}{\text{No. of Data Planned}} \right) \times 100$$

In the overall project context, the target is 100 percent completeness, which for a valid test condition, is defined as consisting of three valid test runs. A valid test run is one in which sufficient valid data are presented to make any necessary demonstrations and to enable the permit writer/reviewer to write appropriate permit conditions or to be confident about demonstration of compliance with a current permit.

A run can be valid even though the completeness objective of 100 percent for the data package is not achieved. Given the possibility of human error (and other unpredictable problems) and the unfeasibility of collecting additional samples after a test is completed, the impact of achieving less than 100 percent completeness must be assessed in the specific situation, rather than arbitrarily rejecting all the useable scientific information for the run without such consideration. For example, satisfying the completeness objective for a single piece of analytical data includes providing documentation that proves the following:

- ☐ An acceptable number of sub-samples were collected and composited;
- ☐ Compositing procedures were followed;
- ☐ The sample collection log was completed;
- ☐ Shipping documents and laboratory instructions were prepared and followed;
- ☐ The correct analytical procedures were followed;
- ☐ Any necessary modifications to methodology were documented and justified;
- ☐ Approved laboratory records were complete;
- ☐ Proper data reduction procedures were followed; and
- ☐ Analytical instrument printouts were included.

Clearly, the failure of a sampler to note the time a sub-sample was taken (where the previous and following sample times are noted) has less impact on the validity and acceptability of a data package than a failure by the laboratory to demonstrate that the analytical instrument was properly calibrated.

Any errors or omissions in a data package will be identified and accompanied by a discussion of potential impact on the validity of the data package, the conclusions of the report, and the demonstration of performance standards for the consideration and approval of the Louisiana Department of Environmental Quality (LDEQ) and USEPA.

6.2 Evaluation of Contamination Effects

Various blanks will be collected throughout the test program to evaluate the effects of contamination on results. Field blanks will be collected and analyzed to evaluate the impact of the sampling train recovery process on test results. Field blanks will be collected for each sampling train at the end of the test program, as noted in Table 6-3. Blank samples of all reagents used in the stack sampling program will also be collected and archived. In the case of VOST analysis, an additional pair of tubes, designated as a trip blank, will be transported to and from the field and otherwise treated as the other cartridges, except that the caps will not be removed. These reagent blanks and trip blanks will only be analyzed in the event of an unsatisfactory field blank result. Method blanks will be analyzed by the respective laboratories to evaluate the cleanliness of sample handling and preparation and overall laboratory practices. All of these blanks provide critical information on the potential contamination that may occur in test program samples. The results of blank analyses can prove very useful when attempting to understand anomalies in data, or generally higher than expected test results.

Since field and reagent blanks cannot be collected for waste samples, the laboratory method blank will be used to determine the effects of contamination for waste analyses. The same criteria will apply to the waste method blanks as the stack method blanks. Table 6-3 provides the type and analysis criteria for each stack blank to be analyzed.

Table 6-3
Blank Analysis Objectives for Stack Gas Samples

Analytical Parameters	Blank Type	Frequency	Objective
Toluene (POHC)	Field blank	One per trial burn	<Reporting limit
	Method blank	One per batch	<Reporting limit
	Trip blank	One per shipment	Archived ¹

¹ Reagent blanks and trip blanks will initially be archived. These blanks will only be analyzed if the field blank indicates possible sample contamination. Possible contamination will be assessed using the objectives for field blanks stated in this table.

6.3 Performance Audits

In order to further evaluate data quality, audit samples may be provided by the regulatory agency. These samples are to be submitted to the respective laboratory and analyzed with the test sample batch.

If available, a VOST Audit will be performed with regulatory oversight. BASF will coordinate the VOST Audit through the USEPA. The cylinder custody seal will only be broken in the presence of a government representative. If a government representative is not present, the VOST audit will not be performed.

The cylinder will be sampled in the presence of the LDEQ/USEPA auditor on the first day of testing. The audit will be performed following all instructions provided in the VOST kit and audit cylinder. The VOST Audit will be conducted according to the Standard Operating Procedures for Performance Audits provided by USEPA Region VI. Additional audit samples at other volumes may be taken and the volumes will be documented.

VOST Audit results will be distributed as soon as available. The VOST Audit results will be included in the final report. Justification for any problems or deficiencies will be included and addressed with the submittal of the audit results and in the regulatory test report.

6.4 Corrective Action

During any testing project, simple or complex, there is potential that deviations from data quality objectives may occur. This section gives corrective action procedures to be used to mitigate such problems.

6.4.1 Equipment Failure

Any equipment found to be out of calibration or operating improperly will be repaired or replaced before additional measurements are made. If equipment repair is made on site, calibrations will be performed in accordance with the applicable USEPA or SW-846 methods prior to use. It may be necessary to transport equipment off-site for calibration. If calibrations cannot be performed, the equipment will not be used. If measurements are made with equipment subsequently found to be out of calibration or operating improperly, a detailed explanation of the cause of the malfunction will be provided. The effect of the malfunction on the data will be assessed and the data will be qualified.

6.4.2 Analytical Deviations

For analyses where a method QC check sample, such as method blank, does not meet method specifications, the problem will be investigated to determine the cause as well as any corrective action that should be taken. Once the corrective action has been taken, the analysis will be re-examined to verify that the problem has been eliminated.

In instances of out of specification spikes or calibrations, the samples involved will be re-extracted or re-analyzed if possible. In those instances where re-analyzing the sample is not possible, such as in the case of VOST analysis, corrective measures will be taken to improve method performance prior to analysis of the next batch of samples.

6.4.3 Contamination

METCO's handling procedures for sorbent traps during all phases of handling, from blank testing to sample collection and analysis, are designed to eliminate contamination in field blank sorbent traps by limiting their exposure to contaminants in the ambient air. If levels of contamination are present above the reporting limits in the field blanks, trip blanks will be analyzed. Corrective action will be taken if the field blanks are significantly different from the trip blanks. METCO will follow the blank correction procedures presented in the relevant method protocol. This comparison will indicate whether high levels in the field blank are due to contamination from exposure to ambient air or from degradation of the sorbent traps. If blank correction is applied, results both with and without the correction will be reported in the report.

6.4.4 Procedural Deviations

SOPs that have been approved by LDEQ through the Louisiana Environmental Laboratory Accreditation Program (LELAP) will be available on-site during all testing. BASF and METCO's project management team will determine an appropriate action in all cases where standard procedures cannot resolve the problem. The action will be implemented after approval from the representatives of the LDEQ.



Section 7

Calibration Procedures and Preventative Maintenance

This section presents a brief discussion of calibration and routine maintenance procedures to be used for sampling and analytical equipment. Criteria for analytical calibrations are also included. Calibration procedures for each analytical method are discussed in detail within the methods themselves.

7.1 Sampling Equipment

All sampling equipment will be provided by METCO. METCO will calibrate the equipment prior to arrival on site. The equipment will also be calibrated after all testing has been completed. The sampling equipment calibration requirements and acceptance limits are listed in Table 7-1.

The equipment is calibrated according to the criteria specified in the reference method being employed. In addition, METCO will follow the guidelines set forth in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods (USEPA, 1994). When these methods are inapplicable, METCO will use methods such as those prescribed by the American Society for Testing Materials (ASTM). Dry gas meters, orifices, nozzles, and pitot tubes are calibrated in accordance with these documents. The range of the calibration is specified for all environmental measurements to encompass the range of probable experimental values. This approach ensures that all results are based upon interpolative analyses rather than extrapolative analyses. Calibrations are designed to include, where practical, at least four measurement points evenly spaced over the range. This practice minimizes the probability that false assumptions of calibration linearity will be made. In addition, it is common practice to select, when practical, at least one calibration value that approximates the levels anticipated in the actual measurement.

Data obtained during calibrations are recorded on standardized forms, which are checked for completeness and accuracy by the Quality Assurance Officer. Data reduction and subsequent calculations are performed using METCO's own computer software. Calculations are checked at least twice for accuracy. Copies of calibration forms will be included in the test or project reports.

Table 7-1
Sampling Equipment Calibration Requirements

Stack Gas Parameter	Quality Parameter	Method of Determination	Frequency	Criteria
Gas flow	Pitot tube angle and dimensions	Measurements with a vernier micrometer and angle indicator	Pre-test Post-test	To specifications in USEPA Method 2
	Barometer	Calibrated vs. National Weather Service Station	Pre-test Post-test	Within 0.1 in. Hg
	Stack gas thermocouple	Calibrated vs. ASTM Hg-in-glass thermometer	Pre-test Post-test	Within 1.5% as degrees Rankin (°R)
Particulate matter (USEPA Method 5)	Dry gas meter	Calibrated against a reference wet test meter	Pre-test Post-test	Y within 0.05 of pretest Y; H @ within 0.15 of pretest
	Probe nozzle ¹	Measurements with a vernier micrometer to 0.001 in.	Pre-test	Maximum difference in any two dimensions within 0.004 in.
	Dry gas meter thermocouples	Calibrated vs. ASTM Hg-in-glass thermometer	Pre-test Post-test	Within 1.5% as °R
	Trip balance	Calibrated vs. standard weights	Pre-test	Within 0.5 g
Toluene (SW-846 Method 0030)	Dry gas meter	Calibrated against a reference wet test meter	Pre-test Post-test	Y within 0.05 of pretest Y; H @ within 0.15 of pretest
	Dry gas meter thermocouples	Calibrated vs. ASTM Hg-in-glass thermometer	Pre-test Post-test	Within 1.5% as °R

¹ Glass or quartz nozzles will be used and the calibration cannot change.

7.1.1 Pitot Tubes

Each pitot tube is inspected in accordance with the geometry standards contained in USEPA Method 2. A calibration coefficient is calculated for each pitot tube.

7.1.2 Differential Pressure Gauges

Fluid manometers do not require calibration other than leak checks. Manometers are leak-checked in the field prior to each test series and again upon completion of testing.

7.1.3 Digital Temperature Indicator

One digital temperature indicator is used to determine the flue gas temperature, probe temperature, oven temperature, impinger outlet temperature, and dry gas meter temperature. The digital temperature indicator is calibrated over a seven-point range

(32 to 450°F) using an ASTM mercury-in-glass thermometer as a reference. The calibration is acceptable if the agreement is within ± 1.5 percent in degrees Rankin (°R) in the temperature range of 50 to 180°F.

7.1.4 Dry Gas Meter and Orifice

A calibrated wet test meter is used to calibrate the dry gas meter and orifice. The full calibration procedure, which uses both a wet test meter and a reference standard, is used to obtain the calibration factor of the dry gas meter. For the orifice, an orifice calibration factor is calculated for each of the 18 flow settings during a full calibration.

7.1.5 Barometer

The stack sampling contractor personnel will calibrate the barometer prior to arrival on site against a National Weather Service Station.

7.1.6 Nozzle

Glass nozzles will be calibrated on site using a micrometer. Eight readings will be taken at quarter turns, followed by two measurements at random. The arithmetic average of the values obtained during the calibration is used.

7.2 Analytical Equipment

Analytical equipment calibration and quality control procedures and internal quality control checks are included to ensure accuracy of the measurements made by laboratory equipment. Table 7-2 provides a summary of the calibration and quality control checks included for each analytical method for this test program.

Table 7-2
Summary of Analytical Equipment Calibration and Quality Control Checks

Parameter	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria
Toluene (POHC)	Initial calibration	Five levels, as per target list	Initially and as needed	≤15% RSD □ Linear RF; >15% RSD (M8000b, §7.0); SPCC RRF >0.10 for chloromethane, 1,1-dichloroethane, and bromoform; SPCC RRF >0.30 for chlorobenzene, and 1,1,2,2-tetrachloroethane; CCC <30% RSD
	Continuing calibration	Continuing calibration verification (CCV)	Every 12 hours following tune as required	SPCC RRF >0.10 for chloromethane, 1,1-dichloroethane, and bromoform; SPCC RRF >0.30 for chlorobenzene, and 1,1,2,2-tetrachloroethane; CCC <20% RSD
	Consistency in chromatography	Internal standards	Every sample and standard	+/- 30 seconds (RT) and 50-200%R

7.3 Waste Spiking Equipment

B3 will perform a calibration check for the spiking equipment using their SOP prior to the trial burn. The SOP is provided as Attachment 5.

7.4 Preventative Maintenance

To ensure the quality and reliability of the data obtained, preventative maintenance is performed on the sampling and analytical equipment. The following sections outline those procedures.

7.4.1 Sampling Equipment

METCO minimizes the potential impact of equipment malfunction on data completeness through two complimentary approaches. First, an in-house equipment maintenance program is part of routine operations. The maintenance program's strengths include:

- Availability of personnel experienced in the details of equipment maintenance and fabrication;
- Maintenance of an adequate spare parts inventory; and
- Availability of tools and specialized equipment.

For field equipment, preventive maintenance schedules are developed from historical data. Table 7-3 gives specific maintenance procedures for field equipment. Maintenance schedules for major analytical instruments (eg., balances, GCs) are based on manufacturer's recommendations.

Table 7-3
Maintenance Activities For Field Sampling Equipment

Equipment	Maintenance Activities	Spare Parts
Vacuum system	Before and after field program: 1) Check oil and oiler jar. 2) Leak check. 3) Vacuum gauge is functional. Yearly or as needed: 1) Replace valves in pump.	Spare fluid
Inclined manometer	Before and after each field program: 1) Leak check. 2) Check fluid for discoloration or visible matter. Yearly or as needed: 1) Disassemble and clean. 2) Replace fluid.	Spare fluid, o-rings
Dry gas meter	Before and after each field program: 1) Check meter dial for erratic rotation. Every 3 months: 1) Remove panels and check for excessive oil or corrosion. 2) Disassemble and clean.	None
Nozzles	Before and after each test: 1) No dents, corrosion or other damage. 2) Glass or quartz nozzles, check for chips and cracks.	Spare nozzles
Diaphragm pump	Before and after each test: 1) Leak check. Change diaphragm if needed.	None
Orsat analyzer	Before each test: 1) Leak check. 2) Inspect for damage.	Reagents, reservoirs
Tedlar bags	Before each test: 1) Leak check. 2) Inspect for damage.	Spare bags
Miscellaneous	---	Fuses, fittings, thermocouples, thermocouple wire, variable transformers.

7.4.2 Analytical Equipment

In addition to including quality control checks in the analysis of test program samples, the laboratories also perform regular inspection and maintenance of the laboratory equipment. Table 7-4 lists some of the routine maintenance procedures associated with the analytical equipment to be used in this test program.

Table 7-4
Maintenance Activities for Analytical Equipment

Parameter	Equipment	Maintenance Procedures
Toluene (POHC)	GC/MS	<ul style="list-style-type: none">▪ Clean source, trap, injector, seal and transfer line▪ Change sparge vessel, filament and septa▪ Change pump oil
Higher heating value (waste samples only)	Bomb calorimeter	<ul style="list-style-type: none">▪ Replace o-rings, as necessary



Section 8

Data Reduction, Validation and Reporting

This section presents the approaches to be used to reduce, validate, and report measurement data. This discussion includes an annotated report outline and describes the reporting conventions that will be applied.

With respect to the BASF project and the Trial Burn Plan, a quality team of companies and laboratories are working together to insure the success of this project. The team will ensure that:

- All raw data packages are paginated and assigned a unique project number. Each project number will reflect the type of analyses performed (i.e., organic, inorganic, waste feed, air emissions).
- The data packages contain a case narrative, sample description information, sample receipt information, chain of custody documentation, and summary report. All associated QA/QC results, Run/Batch data, instrument calibration data, sample extraction/preparation logs, and chromatograms, etc., will be included in the final laboratory report.
- These data are assigned to a specific Appendix in the stack sampling report for easy reference and data review.

The project team routinely compiles large emission test reports that contain all the information in an organized fashion.

8.1 Data Reduction

The methods referenced in this QAPP for field measurements and lab analyses are standard methods and are routinely used for such measurements and analysis. Data reduction procedures will follow the specific calculations presented in the reference methods.

Extreme care will be exercised to ensure that hand recorded data are written accurately and legibly. Additionally, prepared and formatted data recording forms will be required for all data collection. This is an important aid to verify that all necessary data items are recorded. The collected field and laboratory data will be reviewed for correctness and completeness.

METCO will reduce and validate all of the sampling and field measurement data that are collected. The sampling data will include flow measurements, calibrations, etc. STL will reduce all analytical results prior to submission to METCO. The analytical data will be used to determine concentrations and emission rates of the compounds of interest. The manner in which the derived quantities will be reported is discussed in Section 8.3.

8.2 Data Validation

Validation demonstrates that a process, item, data set, or service satisfies the requirements defined by the user. For this program, review and evaluation of documents and records will be performed to assess the validity of samples collected, methodologies used, and data reported. This review comprises three parts: review of field documentation, review of laboratory data reports, and evaluation of data quality.

The sampling and analytical methods for this program have been selected because of their accepted validity for these types of applications. Adherence to the accepted methods, as described in this QAPP, is the first criterion for validation. The effectiveness of the analytical methods as applied to this particular study will be evaluated based on project-specific quality indicators, such as audit samples, replicate samples, matrix, and surrogate spikes.

8.2.1 Review of Field Documentation

Sample validation is intended to ensure that the samples collected are representative of the population under study. Criteria for acceptance include positive identification, documentation of sample shipment, preservation, and storage, and documentation demonstrating adherence to sample collection protocols and QC checks.

As part of the review of field documentation, field data sheets and master logbooks will be checked for completeness, correctness, and consistency. The following specific items will be checked:

- ☐ Sample collection date;
- ☐ Sample identification, type and volume;
- ☐ Analysis requested;
- ☐ Any comments that may affect interpretation of results;
- ☐ Number of required field QC samples (i.e., field blanks, field duplicate samples, matrix spikes);
- ☐ Sample tracking documentation; and

- ☐ Documentation of calibration procedures for field instruments and other field parameters, such as isokinetics, temperatures, volumes, and sampling durations.

8.2.2 Review of Laboratory Data Reports

Both the Quality Assurance Officer and stack sampling contractor personnel will perform a qualitative evaluation of the reported data to verify:

- ☐ Adherence to holding time requirements;
- ☐ Completeness of target analyte lists;
- ☐ Correctness of reporting limits;
- ☐ Correctness and consistency of measurement units;
- ☐ Inclusion of necessary flags and meaningful comments regarding data;
- ☐ Adherence to specified analytical methodologies; and
- ☐ Sample tracking documentation.

8.2.3 Evaluation of Data Quality

Stack sampling contractor personnel will review field and laboratory documentation to assess the following indicators of data quality:

- ☐ Integrity and stability of samples;
- ☐ Performance of instruments used for analysis;
- ☐ Possibility of sample contamination;
- ☐ Identification and quantitation of analytes;
- ☐ Precision; and
- ☐ Accuracy.

This review will be based on evaluation of documentation by the laboratory project manager, laboratory technical reviewers, and stack sampling contractor personnel for each of the following, as appropriate to the analytical method:

- ☐ Analytical and preparation methods used;
- ☐ Sample preservation and custody documentation;
- ☐ Instrument tuning - mass spectrometer;
- ☐ Initial calibration;
- ☐ Continuing calibration verification;

- ☐ Blank analyses;
- ☐ Duplicate samples;
- ☐ Laboratory control samples;
- ☐ Surrogate spike analyses; and
- ☐ Matrix spike analyses.

Review of the above documentation will result in an evaluation of the following parameters:

- ☐ Maximum holding time for samples from date of collection to date of preparation and/or analysis;
- ☐ Sample storage conditions during the holding period prior to analysis;
- ☐ Method used to tune and calibrate instruments;
- ☐ Tuning and calibration acceptance criteria;
- ☐ Acceptance criteria for matrix spike recoveries and matrix spike duplicate precision;
- ☐ Acceptance criteria for surrogate spike recoveries;
- ☐ Frequency of required blank sample analyses; and
- ☐ Frequency and type of performance evaluation sample analyses.

8.3 Data Reporting

All data will be reported in the appropriate units as applicable to the sample stream and the method of analysis. Waste feed analytical results will be reported as concentrations by weight. Emission results will be reported on both a concentration basis and a mass emission rate basis.

8.4 Report Contents

The Trial Burn Report will be submitted to LDEQ and USEPA within 90 days of completing the testing. The Trial Burn Report will be based on the report format specified in the LDEQ's Guidance For Organization, Content, and Format, Trial Burn Report (LDEQ, December 2003). The analytical data packages will be provided in a CLP-like format, as appropriate.

8.5 Reporting Conventions

Specific procedures will be followed when reporting test results. This section describes the conventions for detection limits, correction of data due to background contamination, and the use of significant figures.

8.5.1 Management of Non-Detects

There are several specific situations that will arise in which calculations will need to be performed with non-detect analytical results (at some level). This section presents a series of conventions that will be used for dealing with those situations.

BASF will rely on the reporting limits (RLs) for the analytical methods. For DRE calculations, a non-detect in waste feed will be treated as a zero for the purposes of calculation, and a non-detect in the emissions will be treated as the reporting limit (with a less-than sign) for the purposes of calculation. This will provide for the most conservative estimate of emission rates, DREs and control efficiencies in assessing the performance of the boilers. Note that calculations of emissions using non-detects are reported as maxima (i.e., with less-than, <) and determinations of DRE using non-detects are reported as minima (i.e., with a greater than, >).

In cases where there is more than one component of a sampling train whose results need to be combined, the following guidelines will be used:

- ☐ **All components of a train (or combined analysis) are non-detects.** In this case, the various detection limits will be summed. (Example: If the three separate fractions for VOST are all reported as <10 ng per fraction, the summed result would be less than (10 + 10 + 10) or <30 ng. This provides a conservative estimate of the emissions.)
- ☐ **One or more components of a train (or combined analysis) are non-detects, and there is at least one positive result.** In this case, the non-detects and the positive results are summed and reported as a maximum.

8.5.2 Background Correction

Some of the methods specified for use in this test program allow background or blank correction. Every effort will be made to use reagents and sampling media of the highest quality to ensure that no contamination is indicated in any of the blank samples.

In the event that background contamination is found, any background or blank correction will be carefully documented, and all calculations (e.g., emission rates) will be developed using both corrected and uncorrected data. All corrections will be performed according to the applicable method.

8.5.3 Rounding and Significant Figures

Observational results will be made with as many significant figures as possible. Rounding will be deferred until all resultant calculations have been made. The following rules will be applied in rounding data:

- ☐ When the digit after the one to be rounded is less than five, the one to be rounded is left unchanged; and
- ☐ When the digit after the one to be rounded is greater than or equal to five, the one to be rounded is increased by one.

Intermediate results will be presented in the final report at an appropriate level of significance (i.e., rounded, although the derived, or resultant, calculations will be based on unrounded intermediate data.) Consequently, it may not be possible to precisely reconstruct the resultant calculations on any particular table from the rounded intermediate results, due to rounding errors.



Section 9

Quality Assurance Reports

Activities affecting quality will be reviewed by the project team daily in the field and as appropriate during non-field efforts. This will allow assessment of the overall effectiveness of the QAPP. These reviews will include the following:

- Summary of key QA activities, stressing measures that are being taken to ensure adherence to the QAPP;
- Description of problems observed that may impact data quality and corrective actions taken;
- Status of sample shipment and integrity at time of receipt and progress of sample analysis;
- Assessment of the QC data gathered over that time period;
- Any changes in QA organizational activities and personnel; and
- Results of internal or external assessments and the plan for correcting identified deficiencies, if any.

The testing program to be conducted at BASF will have multiple tiers of QA/QC reviews. The specific laboratory performing the analysis will review the data they are responsible for and the laboratory project manager will sign the analytical data reports. Any QA/QC anomalies will be discussed in the case narrative. METCO will also review the laboratory data package to discuss how the QA/QC anomalies may impact the emissions calculations. BASF is also providing a Quality Assurance Officer for both on-site data collection and post analyses data review. Any data that is determined to be invalid will be stated in the final report and the impact of the invalid data on the test program will be assessed. Through this multiple tier process, all stages of the testing program will be tracked, monitored, reviewed, and documented.



Section 10

References

USEPA. April 1998. Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods. USEPA 530/ SW-846 upd.5.

USEPA. 1994. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods. Office of Research and Development. EPA/600/R-94/038C.

USEPA. February 1991. Preparation Aids for the Development of Category I Quality Assurance Project Plan. Office of Research and Development. EPA/600/8-91/003.

USEPA. 1990. Handbook: QA/QC Procedures for Hazardous Waste Incineration. Office of Research and Development. EPA/625/6-89/023.

USEPA. New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR Part 60.



Attachment 1

Laboratory Contact Information

Laboratory Contact Information

METCO Environmental, Inc.
3226 Commander Drive
Carrollton, TX 75006
Ph: 800-394-1194
Fx: 972-931-8398
Attn: Blair Shields

Severn Trent Laboratories
5815 Middlebrook Pike
Knoxville, TN 37921
Ph: 865-291-3000
Fx: 865-584-4315
Attn: Kevin Woodcock



Attachment 2

Contractor Contact Information

Contractor Contact Information

RMT, Inc.

Ms. S. Heather McHale, P.E.
527 Plymouth Road, Suite 406
Plymouth Meeting, PA 19462-1641

Ph: 610-834-0490 □ Ext. 6119

Fx: 610-834-1469

METCO Environmental, Inc.

Mr. Blair Shields
3226 Commander Drive
Carrollton, TX 75006

Ph: 800-394-1194

Fx: 972-931-8398

B-3 Systems, Inc.

Mr. Dan Ealy
7711 Welborn Street, Suite 106
Raleigh, NC 27615

Ph: 919-790-9090

Fx: 919-790-0550



Attachment 3

Project Team Resumes



S. Heather McHale, P.E.
 Manager □ Combustion Services

Experience

Heather is a chemical engineer with 16 years of experience in the areas of Maximum Available Control Technology (MACT) permitting, Resource Conservation and Recovery Act (RCRA) permitting, boiler and industrial furnace (BIF) permitting, Commercial and Industrial Solid Waste Incinerator (CISWI) permitting, process design, incineration, air pollution control, air dispersion and deposition modeling, risk assessments, Title V permits, and heat and material balances. Heather has prepared numerous trial burn plans, and she has coordinated trial burn testing for hazardous waste combustion clients. She has provided on-site technical assistance for the startup and shakedown of a hazardous waste incinerator.

Heather serves as project manager on such projects as hazardous waste incinerator and boiler permitting, multipathway risk assessment, hazardous waste combustor (HWC) MACT compliance, and Industrial Boiler MACT compliance. Heather has developed numerous gap analyses, Notifications of Intent to Comply (NICs), comprehensive performance test (CPT) plans and reports, and required operating plans for facilities preparing to comply with HWC MACT. Heather is the primary client contact on all matters for projects and the primary contact in negotiations with regulatory agencies.

Areas of Expertise

- Hazardous Waste Combustors MACT compliance
- RCRA/BIF trial burns and risk burns
- Industrial Boiler MACT compliance
- CISWI compliance
- Air pollution control design and permitting
- Multipathway risk assessments

Key Projects

Hazardous Waste Incineration. Honeywell International, Inc., Hopewell Facility (Virginia). Project Manager.

Provided overall project management duties for the project. The project included engineering and regulatory consulting for a facility that operated a hazardous waste incinerator. Developed a RCRA trial burn plan and risk burn plan for the incineration system. A trial burn was conducted in the fourth quarter of 1998. A risk burn was conducted in the fourth quarter of 1999. Acted as the overall coordinator of trial-burn and risk-burn activities, including the management of the stack sampling contractor and on-site supervision of testing. Developed the Part B Permit renewal application, including a site-specific multipathway risk assessment protocol and report, for submittal to the Virginia Department of Environmental Quality (VDEQ). Assisted client with negotiations with the VDEQ throughout the project. Currently assisting Honeywell with all aspects of HWC MACT compliance.



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Hazardous Waste Incinerator. Bayer Material Science, LLC. New Martinsville Facility (West Virginia). Project Manager.

Provided overall project management duties for the project. Developed the HWC MACT CPT plan and continuous monitoring systems (CMS) performance evaluation test (PET) plan, coordinate all testing activities, and assist with all regulatory negotiations. The CPT Plan and CMS PET plan were submitted to the West Virginia Division of Environmental Protection (WVDEP) and approved in April 2003. Developed a multipathway risk assessment protocol, in accordance with USEPA guidance. Served as test manager and regulatory liaison during the CPT execution, and prepared the Notification of Compliance and CPT report. Prepared the multipathway risk assessment.

Hazardous Waste Incinerator. PPG Industries, Inc. Lake Charles Facility (Louisiana). Project Manager.

Provided overall project management duties for the project. Provided consulting services to assist clients in preparing for compliance with the HWC MACT standards. The project included a detailed "gap analysis" to determine the activities that would be necessary to bring the two liquid injection hazardous waste incinerators into compliance with the regulations. Developed a combined HWC MACT CPT plan and RCRA trial burn/ risk burn plan for the incinerators. Also developed a CMS PET plan and all of the operating plans required by HWC MACT. Served as test manager and regulatory liaison during the CPT execution, and prepared the Notification of Compliance and CPT report. Will continue to assist with regulatory negotiations throughout the permitting process.

Hazardous Waste Incinerator. Asahi Glass Fluoropolymers USA, Inc. Bayonne Plant (New Jersey). Project Manager.

Provided consulting services to assist client in preparing for compliance with the HWC MACT standards. The project included a detailed "gap analysis" to determine the activities that would be necessary to bring the hazardous waste incinerator into compliance with the regulations. Developed the CPT plan and CMS PET plan and all of the operating plans required by HWC MACT. Served as test manager and regulatory liaison during the CPT execution, and prepared the Notification of Compliance and CPT report. Will continue to assist with regulatory negotiations throughout the permitting process.

Hazardous Waste Incinerator. Syngenta Crop Protection, Inc. St. Gabriel Facility (Louisiana). Project Manager.

Provided overall project management duties for the project. Provided consulting services to assist client in preparing for compliance with the HWC



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MACT standards. Developed a combined HWC MACT CPT plan and risk burn plan for the rotary kiln incinerator. Served as test manager and regulatory liaison during the CPT execution, and prepared the Notification of Compliance and CPT report.

Hazardous Waste Incinerators. U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM). Various Locations. Project Manager
 Provided overall project management duties for the project. Provided regulatory support for HWC MACT projects for APE 1236M2 deactivation furnaces operated at various U.S. Army facilities, including Tooele Army Depot (TEAD) in Tooele, Utah, McAlester Army Ammunition Plant (MCAAP) in McAlester, Oklahoma, and Crane Army Ammunition Activity (CAAA) in Crane, Indiana. Prepared the required operating plans for each facility, including the feedstream analysis plan, the startup, shutdown, and malfunction (SSM) plan, the operation and maintenance plan, and the continuous monitoring systems (CMS) performance evaluation plan. Provide oversight during the CPTs and developed the CPT reports.

Deactivation Facility Thermal Treatment Unit. Advanced Environmental Technology, Inc. Iowa Army Ammunition Plant. Project Manager.
 Provided overall project management duties for the project. Provided consulting services to assist client with compliance with RCRA Subpart X requirements. Prepared a trial burn/ risk burn plan for a thermal treatment unit located at AET's Deactivation Facility operated at the Iowa Army Ammunition Plant (IAAAP) and assisted with regulatory negotiations to obtain USEPA-approval of the plan. Organized, coordinated, and provided oversight for the trial burn/ risk burn stack testing. Currently developing the trial burn/ risk burn report. Also performing a multipathway risk assessment (MPRA).

Industrial Boilers Burning Hazardous Waste. Bayer CropScience, Institute Plant (West Virginia). Project Manager
 Provided overall project management duties for the project. The project work included engineering and regulatory consulting for a facility that operates three hazardous waste-burning boilers. Developed a RCRA trial burn/ risk burn plan for the boilers. A mini-burn and trial burn/ risk burn were conducted 2004. Developed the trial burn/ risk burn report for submittal to WVDEP. Developed a multipathway risk assessment protocol and report. Assisted the client in negotiations with the WVDEP throughout the project.



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Industrial Boilers Burning Hazardous Waste. Lonza, Inc., Bayport Plant (Texas). Project Manager

Provided overall project management duties for the project. The project work included engineering and regulatory consulting for a facility that operates three hazardous waste-burning boilers. Developed a RCRA trial burn/ risk burn plan and a mini-burn plan for the boilers. Mini-burn and trial burn were conducted in 1999/ 2000. Acted as the coordinator of stack test activities, including the management of the stack sampling contractor and the on-site supervision of testing. Developed the Part B Permit Application for submittal to the Texas Natural Resource Conservation Commission (TNRCC). Assisted the client in negotiations with the TNRCC throughout the project.

Industrial Boilers Burning Hazardous Waste. Huntsman Corporation, Port Neches Facility (Texas). Project Manager.

The work included engineering and regulatory consulting for a facility that operates four hazardous waste-burning boilers. Developed two RCRA trial burn/ risk burn plans and a mini-burn plan for the boilers. Mini-burns and trial burns were conducted in 1999. Acted as the overall coordinator of stack test activities, including the management of the stack sampling contractor and on-site supervision of testing. Assisted the client in negotiations with the TNRCC throughout the project.

Industrial Boiler MACT Applicability and Compliance Evaluation. Pulp and Paper Facilities (Multiple Locations). Project Manager.

Provided overall project management duties for the projects. The project included engineering and regulatory consulting for company with multiple facilities that operate solid fuel-fired industrial boilers. Provided consulting services to assist clients in preparing for compliance with the Industrial Boiler MACT standards. The project included a detailed "gap analysis" to determine the activities that would be necessary to bring the units into compliance with the new regulations. The gap analysis included an applicability determination, an evaluation of available emission data to determine compliance with emission standards, and a review of the monitoring, reporting, and record keeping requirements.

Hazardous Waste Incineration. Confidential Client (Mexico). Project Manager.

Provided overall project management duties for the project. Project work included engineering and regulatory consulting for a facility that operated two hazardous waste incinerators. Prepared a detailed engineering review, including recommendations for system modifications. Prepared specifications



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for equipment modifications. Developed a RCRA-type trial burn plan for the incineration systems. A trial burn was conducted in the fourth quarter of 1996. This was the first test burn of this type to be conducted in Mexico. Acted as the overall coordinator of trial burn activities, including the management of the stack sampling contractor and the on-site supervision of testing. Assisted the client in negotiations with the Mexican regulatory agencies.

Commercial Hazardous Waste Incineration System. Laidlaw Environmental Services, Inc., Clive Incineration Facility (Utah). Process Engineer.

Developed a RCRA trial burn plan for a commercial hazardous waste incineration system. Developed multiple test conditions to demonstrate the maximum capacity of the system and to provide flexible permit conditions. Provided on-site technical assistance for the incinerator during the startup/shutdown period. Prepared mini-burn plans and reports. Worked with a computer process data retrieval system to provide operational data for mini-burn and trial-burn testing. Used computer simulations as a tool in troubleshooting the incinerator's performance.

Reasonable Available Control Technology Determination and Compliance Plan. Metals Recovery Facility (Pennsylvania). Project Manager.

Prepared a Reasonable Available Control Technology (RACT) Determination and Compliance Plan for a high-temperature metals recovery facility. The facility was identified as a major source of nitrogen oxide and volatile organic compounds (VOCs). The work included a site survey to conduct an emission inventory and to collect design and operating data. Calculated the actual and potential emissions on an hourly and annual basis for each source. Identified and qualified de minimis VOC sources. Identified, qualified, and described all of the applicable VOC control technologies for each source. Prepared detailed cost estimates of each technically feasible control technology and RACT cost analysis to determine the most cost-effective control for each source. The RACT plan was accepted as administratively and technically complete by the Pennsylvania Department of Environmental Protection (PA DEP). An operating permit was issued to the facility based on the RACT determination and compliance plan.

Title V Permitting. Multiple Facilities (Delaware, Illinois, Kentucky, New Jersey, New York, Pennsylvania, and Wisconsin). Project Engineer.

Prepared Title V permit applications for facilities in Delaware, Illinois, Kentucky, New Jersey, New York, Pennsylvania, and Wisconsin. Sources permitted included high-temperature metal recovery facilities, grey iron and steel foundries, metal coating operations, rotogravure printing operations, resin



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manufacturers, and a specialty paper coating manufacturer. The work for each permitting project included a site survey to conduct an emission inventory and to collect existing facility design, permitting, and operating data. Conducted a database and literature search to determine emission and control efficiency factors. Calculated the actual and potential emissions on an hourly and annual basis. Prepared a detailed description of facility operations and each emission source, including process flow diagrams. Determined the applicable regulatory requirements for the facilities, and performed compliance audits. Completed all the required state permit forms for the facility, and for each source, stack, piece of control equipment, and emission/ process monitor.

Computer Program Development: Incineration and Air Pollution Control Performance Prediction and Incineration System Design, Emission Inventories for Clean Air Act Applications, and Multipathway Risk Assessment for Hazardous Waste Combustors.

Developed several computer programs for the prediction of incineration and air pollution control system performance. Developed the computer programs used to size incineration systems, to determine emissions from systems, and to establish operating parameters for systems. Developed a computer program for emission inventories for Reasonable Available Control Technology and Title V projects. The program is used to calculate actual and potential emissions for criteria pollutants, as well as for hazardous air pollutants, on both an hourly and an annual basis. Developed computer program for multipathway risk assessment calculations, following the procedures of USEPA guidance document, Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (EPA 530-D-98-001A).

Education and Training

B.S., Chemical Engineering, Penn State University, University Park, 1988

Air Emission Dispersion Modeling Workshop

Stack Sampling Workshop

Affiliations

American Institute of Chemical Engineers

Air and Waste Management Association



S. Heather McHale, P.E.
 Manager □ Combustion Services

Registrations and Certifications

Registered Professional Engineer □ New York and Pennsylvania

Publications and Presentation

Gehring, M. E., McHale, S. H., and Morse, R. D. 2004. "EHS Management Systems and HWC MACT Compliance." Presented at the 23rd International Conference on Incineration and Thermal Treatment Technologies. May 2004. Phoenix, Arizona.

McHale, S. H. and Gehring, M. E. 2003. □ HWC MACT from NIC to NOC - An Industry Survey. □ Presented at the 22nd International Conference on Incineration and Thermal Treatment Technologies. May 2003. Orlando, Florida.

McHale, S. H. and Gehring, M. E. 2002. □ Workshop: Startup, Shutdown, and Malfunction Plans for Hazardous Waste Combustors. □ Presented at the 21st International Conference on Incineration and Thermal Treatment Technologies. May 2002. New Orleans, Louisiana.

McHale, S. H. and Budin, M. □ Comparative Analysis: RCRA Trial Burn & HWC MACT Comprehensive Performance Test. □ Presented at the 2002 AWMA Hazardous Waste Combustor Specialty Conference. April 2002. St. Louis, Missouri.

Tidona, R. J. and McHale, S. H. □ The HWC MACT Rule: What Does It Mean To Me? □ Presented at the 16th International Conference on Incineration and Thermal Treatment Technologies. May 1997. Oakland, California.

Contributing author on □ Introduction to Hazardous Waste Incineration, □ Second Edition, Section 3: Standards and Regulations, published in 2000.



THOMAS 'Blair' SHIELDS; Project Supervisor II

Education

B.S. Environmental Science, May 18, 1990; Concordia College, Bronxville, New York.

Technical Experience

Participated in the sampling of over 250 emission test programs (20 of which were trial burns of RCRA-permitted sources). Served as the Project Supervisor for more than 100 emission test programs, including several high profile projects within the chemical and petrochemical industry where emission data was used for dispersion modeling and risk assessment purposes. Additionally, Blair has functioned as a Project Supervisor on projects requiring subcontractor support for spiking and EPA Method 18 analysis. Specifically, Blair has an established relationship with Field Portable Analytical, METCO's proposed EPA Method 18 subcontractor.

Emission testing experience includes project assignments in various industries such as:

- Power generation
- Petrochemical
- Synthetic Organic Chemical Manufacturing
- Chemical
- Pulp and paper
- Food
- Hazardous Waste Incineration

Tested sources include:

- Incinerators and Flares
- Thermal and Catalytic Oxidizers
- Wet and Dry Scrubbers of Various Designs
- Electrostatic Precipitators
- Turbines
- Boilers

(continued)



SHIELDS, Blair (cont'd)

Technical
Experience
(cont'd)

- Process Vents in chemical, petrochemical, pulp and paper industries.
- Batch, Continuous, and Semi-continuous purposes.
- Data generated from these test programs has been used to:
 - o Demonstrate compliance with permit conditions.
 - o Support revisions of permit conditions
 - o Validate continuous emission monitor and control device performance.
 - o Support design of control devices
 - o Support in-house engineering and evaluation projects

Thoroughly trained and experienced in the following EPA Methods:

- CFR Title 40, Chapter 1, Part 60, EPA Methods 1 through 17, 20, 23, 25A, 26A, and 29
- Methods 0010, 23A, 0030, 0060, and 0061
- Particle Size Distribution Analysis

Has performed on-site analysis for gravimetric particulate, sulfur trioxide (SO₃) and sulfur dioxide (SO₂).

Experienced in the sampling of commercial calibration gas cylinders for sulfur dioxide, oxides of nitrogen, carbon dioxide, oxygen, and carbon monoxide.

(continued)



SHIELDS, Blair (cont'd)

Technical
Experience
(cont'd)

Thoroughly trained in the operation and routine maintenance of the following:

- Thermo Environmental Model 10S Oxides of Nitrogen Analyzer
- Thermo Environmental Model 48 Carbon Monoxide Analyzer
- Teledyne Model 326 Oxygen Analyzer
- Western Research Model 721M Sulfur Dioxide Analyzer
- Horiba Model PIR 2000 Carbon Dioxide Analyzer
- J.U.M. Model VE-7 Total Hydrocarbon Analyzer
- ESC Data Acquisition System

Thoroughly trained in the calibration techniques for all field testing equipment.

Professional
Training
Courses

Attended 40-hour Occupational and Environmental training program on Hazardous Materials (CFR 1910.120) in Baton Rouge, Louisiana, March of 1999.

Also attended an 8-hour refresher course for CFR 1910.120 (given annually).



JERVEY C. CHEVEALLIER; Manager, Baton Rouge Operations

Education

B.S. in Wildlife and Fisheries, 1994; Louisiana State University; Baton Rouge, Louisiana.

**Professional
Training
Courses**

Attended 40-hour Occupational and Environmental training program on Hazardous Materials (CFR 1910.120) in Baton Rouge, Louisiana, March of 1999.

Also attended an 8-hour refresher course for CFR 1910.120 (given annually).

**Technical
Experience**

Participated in the sampling of over 500 sourcers (50 of which were trial burns). Serving in the supervisory capacity of over 300 sources, including several of which were sampled simultaneously using more than one sampling train.

Thoroughly trained in all EPA testing procedures, 1996-present.

Testing experience in various industries such as:

- Power generation,
- Cement,
- Glass,
- Food,
- Oil and gas,
- Pulp and paper,
- Chemical, and
- Incineration

Supervised projects for Owens Brockway in Atlanta, Georgia; First Chemical in Pascagoula, Mississippi; U.S. Alliance in Coosa Pines, Alabama; and Pepperidge Farms in Richmond, Utah.

(continued)



CHEVEALLIER, Jervey (cont'd)

Technical
Experience
(cont'd)

Over three years experience with EPA and Texas Air Control Board (TACB) methods of sampling stationary sources.

Thoroughly trained in the following EPA Methods: CFR Title 40, Chapter 1, Part 60, EPA Methods 1 through 17, 20, 23, 25A, 26A, and 29.

Experienced with sampling EPA Methods 0010, 23A, 0030, 0060, and 0061.

Experienced with particle-size sampling with the Andersen impactor method.

Has performed on-site analysis for gravimetric particulate, sulfur trioxide and sulfur dioxide.

Experienced in the sampling of commercial calibration gas cylinders for sulfur dioxide, oxides of nitrogen, carbon dioxide, oxygen, and carbon monoxide.

Thoroughly trained in the operation and routine maintenance of the following:

- Thermo Environmental Model 10S Oxides of Nitrogen Analyzer
- Thermo Environmental Model 48 Carbon Monoxide Analyzer
- Teledyne Model 326 Oxygen Analyzer
- Western Research Model 721M Sulfur Dioxide Analyzer

(continued)



CHEVEALLIER, Jervy (cont'd)

Technical
Experience
(cont'd)

- Horiba Model PIR 2000 Carbon Dioxide Analyzer
- J.U.M. Model VE-7 Total Hydrocarbon Analyzer
- ESC Data Acquisition System
- Thoroughly trained in the calibration techniques for all field testing equipment.



ROBERT E. ADAMS, Ph.D.; Project Manager

Education

Ph.D. Analytical Chemistry, 1977; University of Georgia, Athens, Georgia.

B.S. Chemistry, 1971; University of North Carolina, Chapel Hill, North Carolina.

Professional Memberships

American Chemical Society, Analytical Division
Air and Waste Management Association
Alpha Chi Sigma

Technical Experience

Participated in the sampling of multiple sources, including several of which were sampled simultaneously using more than one sampling train, from 1990-present.

As a Quality Assurance Director, conducted quality audits, implemented new methods, and improved laboratory operations for several environmental laboratories. Also, worked to develop proposals and review reports.

Supervised the development and reviewed, under stringent quality assurance/ quality control (QA/QC), generalized GC, HPLC, and GC/MS methods for the analysis of hazardous waste incinerator effluents. QA/QC plans were developed to control these experiments.

Developed procedures for the analysis of volatile and semi-volatile organic compounds as an Organic Lab Manager.

Managed the analysis of hazardous waste samples for EPA's Superfund program (2 contracts). This program involved the determination of volatiles and base/neutral/acid fractions by GC/MS and pesticides by GC/ECD.

(continued)



ADAMS, Robert E., Ph.D.; (continued)

Technical
Experience
(cont'd)

Thoroughly trained in the operation and routine maintenance of the following:

- Agilent 1090 HPLC
- Agilent 5971 GC/MS
- Agilent 5972 GC/MS
- Agilent 5973 GC/MS
- Agilent 5890 GC/FID/ECD/FPD
- Extractive FTIR
- Shimadzu GC 17 FID
- Shimadzu GC 14 FID/FPD
- Perkin-Elmer A Analyst Graphite Furnace AA
- Leeman Labs DRE ICP-AES
- Dionex 100 Ion Chromatograph

Professional
Training
Courses

Attended 40-hour Hazardous Waste Operations and Emergency Response in accordance with 29 CFR 1910.120, Dallas, Texas in February 2004. Also attended 8-hour HAZWOPER refresher course from 2005.

Certifications

Adult CPR certified
Standard First Aid certified
HAZWOPER certified

Publications and
Presentations

Adams, R.E.; Caudle, M.D. *The Use of Portable FTIR for Industrial Gas Analysis and Process Optimization*. Paper presented at the Air and Waste Management Association—Southern Section 2002 Annual Meeting and Technical Conference, Orange Beach, AL; 2002 September 15-18.

Weinberg, D.S.; Adams, R.E.; Manier, M.L. *Software Programs for Processing PCDF/PCDD GC/MS Data*. Paper presented at the 39th ASMA Conference on Mass Spectrometry and Allied Topics, Nashville, TN; 1991 May 19-24.

(continued)



ADAMS, Robert E., Ph.D.; (continued)

Publications and
Presentations
(cont'd)

Weinberg, D.S.; Adams, R.E.; Manier, M.L. *Evaluation of a Particle-Beam Liquid Chromatograph/Mass Spectrometer*. Paper presented at the 39th ASMA Conference on Mass Spectrometry and Allied Topics, Nashville, TN; 1991 May 19-24.

Adams, R.E.; Hass, J.R.; Smith, W.S.; Wong, T. *Sampling and Analysis for Volatile and Semivolatile POHC During RCRA Trial Burns: Techniques and Problems*. Proceedings of the 80th annual meeting of the Air Pollution Control Association, New York, NY; 1987, June 21-26.

Adams, R.E.; James, R.H.; Burford, L.A.; Miller, H.C.; Johnson, L.D. *Analytical Methods for Determination of POHC in Combustion Products*. Environ. Sci. Technol. 20: 761-769; 1986. Paper presented at the Symposium on Organic Emission from Combustion, 187th ACS national meeting; 1984 April; St. Louis, MO.

Adams, R.E.; Thomason, M.M.; Strother, D.L.; James, R.H.; Miller, H.C. *The Determination of PCDDs and PCDFs in PCB Oil From a Hazardous Waste Site*. Paper presented at the 5th International Symposium on Chlorinated Dioxins and Related Compounds. Bayreuth, Federal Republic of Germany; 1985, September 16-19. Chemosphere 15: 1113-1121; 1986.

James, R.H.; Adams, R.E.; Johnson, L.D. *A Simplified Sampling and Analysis System for the Determination of Volatile Organic Compounds in Combustion Effluents*. Proceedings of the 79th Annual Meeting of the Air Pollution Control Association. Minneapolis, MN; 1986, June 22-27.

James, R.H.; Adams, R.E.; Finkel, J.M.; Miller, H.C.; Johnson, L.D. *Evaluation of Analytical Methods for the Determination of POHC in Combustion Products*. J. Air Pollut. Control Assoc. 35: 959-989; 1985.

(continued)



ADAMS, Robert E., Ph.D.; (continued)

Publications and
Presentations
(cont'd)

James, R.H.; Adams, R.E.; Thomason, M.M.; Johnson, L.D.
*Measuring Products of Combustion-Analytical Methods for POHCs
and PICs.* Proceedings of the Fifth Annual National Symposium on
Recent Advances in the Measurement of Air Pollutants. Raleigh,
NC; 1985, May 14-16.

Thomason, M.M.; James, R.H.; Adams, R.E.; Johnson, L.D.
Products of Incomplete Combustion-Analytical Methods.
Proceedings of the Eleventh Annual Research Symposium on Land
Disposal, Remedial Action, Incineration, and Treatment of
Hazardous Waste. Cincinnati, OH; 1985, April 29-May 1.

Adams, R.E. *Positive and Negative Chemical Ionization Pyrolysis
Mass Spectrometry of Polymers.* Anal. Chem. 55: 414-416; 1983.
Paper-presented at the 33rd Southeast regional ACS meeting.
Lexington, KY; 1981 November.

Adams, R.E. *Pyrolysis Mass Spectrometry of Terephthalate Based
Polyesters Using Chemical Ionization and Negative Ion Detection.*
J. Polym. Sci. 20: 119-129; 1982. Paper presented at the
Southeast-Southwest regional ACS meeting. New Orleans, LA;
1980 December.

Adams, R.E.; Carr, P.W. *Coulometric Flow Analyzer for Use With
Immobilized Enzyme Reactors.* Anal. Chem. 50: 944-950; 1978.
Invited paper at the 11th Great Lakes regional ACS meeting.
Stevens Point, WI; 1977 June.

Adams, R.E.; Betso, S.R.; Carr, P.W. *Electrochemical pH-stat and
Controlled Current Acid-Base Analyzer.* Anal. Chem. 48: 1989-
1996; 1976. Paper presented at the 27th Pittsburgh Conference on
Analytical Chemistry and Applied Spectroscopy. Cleveland, OH;
1976 March.

(continued)



ADAMS, Robert E., Ph.D.; (continued)

Publications and
Presentations
(cont'd)

Klatt, L.N.; Connell, D.R.; Adams, R.E.; Honigberg, I.L.; Price, J.C.
Voltametric Characterization of a Graphite-Teflon Electrode. *Analy.*
Chem. 47: 2470-2472; 1975.

Adams, R.E. *Development and Application of a Totally
Electrochemical pH-stat and Controlled Current Acid-Base
Analyzer for Biological Studies.* Athens, GA; University of
Georgia; 1977. 151 p. Dissertation.

Daniel P. Ealy



EDUCATION

A.S. Mechanical Engineering, Penn State University, 1988

EMPLOYMENT HISTORY

B3 Systems, Inc., Raleigh, North Carolina. 1993- present.
U.S. Pollution Control, Inc., Lakepoint, Utah. Process Operator, 1991 - 1993
Norwood, Inc., Beckley, West Virginia. Sales Engineer, 1990 - 1991

RECORD OF EXPERIENCE

Overview. Mr. Ealy has experience in hazardous waste incineration, low temperature thermal desorption, waste water treatment, sample collection, preparation and tracking.

B3 Systems. *Specific Duties, Responsibilities, and Assignments:* Mr. Ealy provides direct support for B3 Systems field services and equipment maintenance. He is responsible for materials procurement, equipment delivery, and overall project logistics.

Process Operator, USPCI. *Specific Duties, Responsibilities, and Assignments:* Mr. Ealy was responsible for a wide variety of project-specific duties for USPCI, as described below.

Mobile Thermal Recycling Unit (MTRU), Union Pacific Railroad, Las Vegas, Nevada. Mr. Ealy was a senior board operator for the MTRU. Responsibilities for this position consisted of supervising a 3-man crew on a 12-hour shift. He also ensured optimum operation of the unit feed rates and stack emissions. Mr. Ealy was responsible for maintaining sampling procedures and ensuring all employees followed sampling guidelines. He was also involved with the shakedown, stack testing and operator training in Las Vegas.

On site Incineration and Source Removal, Laskin Poplar Superfund Site, Ashtabula County, Ohio
Mr. Ealy operated the Waste Water Treatment Plant. Under his supervision, the facility treated over three million gallons of water in one and a half years. He was also involved with the set-up, de-bugging, daily maintenance, chemical ordering, and chemical storage. As an on-site Sample Director, Mr. Ealy was responsible for ensuring that quality assurance/quality control (QA/QC) procedures as outlined in the Quality Assurance Project Plan (QAPP) were followed.

Sales Engineer, Norwood, Inc. *Specific Duties, Responsibilities and Assignments:* Mr. Ealy coordinated the sale of construction material to the coal industry. While working as a cost estimator, he ensured proper engineering of erosion fence, erosion control block, geo fabric, and corrugated steel pipe installations.

PUBLICATIONS AND PRESENTATIONS

Safety Concerns for Chemical Spiking at Trial Burns, Hazardous Waste Combustion Specialty Conference, Dallas, Texas, September 1999, written and co-presented with Robert W. Baxter

ADDITIONAL TRAINING AND CERTIFICATIONS

40 Hour OSHA Hazardous Waste Training
Safety Council Training from various areas
DOT Hazardous Materials Transportation Training
DOT Hazardous Materials Waste Shipping



Attachment 4

Example Waste Feed

Sampling Form

Process Sample Field Data Sheet

Job No.: _____
Sampler: _____
Condition: _____
Run Number: _____

Job Name: _____
Date of Sampling: _____
Location: _____
Run Description: _____

Sample Identification No.: Liquid Waste Feed Valve Number: _____

Equipment: (2-3) 4 liter sample bottle, (~28) 125 ml Sample Bottles, (~28) VOAs, (4) 500 ml Composite Bottles, (2) 500 ml Beakers, (1) Funnel.

INSTRUCTIONS

1. Before the trial burn run starts, clear sampling line by opening the tap and collecting approximately 250 ml of sample into a beaker. Examine sample to assure the liquid is homogeneous (e.g., free from solids, sludge, etc.) and discard into waste container. If not, contact field-sampling crew chief before trial burn starts.
2. At the beginning of the trail burn and every 30 minutes (+/- 5 minutes), open the tap; rinse the two sub-sample containers (125 ml bottles) with approximately 100 ml and discard into the waste container. Open tap and fill the rinsed sub-sample containers and cap. Open the tap and fill the two VOA vials, assuring no head space is present.
3. Record the time, and comments. Discard surplus sample into the waste container.
4. Use Teflon tape to seal VOA cap.
5. Repeat steps 2-4 every 30 minutes of elapsed sampling time for the run (4-5 hour minimum). The timing of the 30-minute intervals is to be suspended whenever sampling is interrupted.
6. At the end of the tests empty 125 ml sub-samples (22-28) into 4-liter jugs and mix for the composite sample. Transfer the composite sample into the appropriate labeled containers; seal with Teflon tape and secure custody seal on composite cap.
7. Following the traceability procedures, ensure that jars are sealed and labeled; and place on ice, and fill out the necessary chain of custody forms.
8. Deliver the samples to the field sample custodian for packaging and shipment.

**Process Sample Field Data Sheet
For Liquid Waste Feed**

VOA No.	VOA No.	Time of Grab	125 ml No.	125 ml No.	Initials
C R -04233-LW-V-1	C R -04233-LW-V-2		1-1A	1-1B	
C R -04233-LW-V-3	C R -04233-LW-V-4		1-2A	1-2B	
C R -04233-LW-V-5	C R -04233-LW-V-6		1-3A	1-3B	
C R -04233-LW-V-7	C R -04233-LW-V-8		1-4A	1-4B	
C R -04233-LW-V-9	C R -04233-LW-V-10		1-5A	1-5B	
C R -04233-LW-V-11	C R -04233-LW-V-12		1-6A	1-6B	
C R -04233-LW-V-13	C R -04233-LW-V-14		1-7A	1-7B	
C R -04233-LW-V-15	C R -04233-LW-V-16		1-8A	1-8B	
C R -04233-LW-V-17	C R -04233-LW-V-18		1-9A	1-9B	
C R -04233-LW-V-19	C R -04233-LW-V-20		1-10A	1-10B	
C R -04233-LW-V-21	C R -04233-LW-V-22		1-11A	1-11B	
C R -04233-LW-V-23	C R -04233-LW-V-24		1-12A	1-12B	
C R -04233-LW-V-25	C R -04233-LW-V-26		1-13A	1-13B	
C R -04233-LW-V-27	C R -04233-LW-V-28		1-14A	1-14B	

Time of Composite	500 ml Composite Sample No.	Initials
	C R -04233-LW-1/2L-1	

Remarks: Two 1/2L composite samples will be archived on-site and two 1/2L composite samples will be sent off for analysis.



Attachment 5

B3 Standard Operating Procedure for Calibration Checks



STANDARD OPERATING PROCEDURE (SOP)
CALIBRATION CHECKS FOR PUMP SKIDS

STEP

1. Hook up metering skid, data acquisition system, tubing, etc.
2. Set up scale. Check with certified weights for accuracy.
3. Flush a fluid (water is recommended) through the metering system sufficient for purge any air bubbles from the system, stop the fluid and close the end valve. Special care should be given to insuring that the system is void of any air space since this introduces error.
4. Tare the fluid container, Zero the DAHS and the Micro-Motion totalizer.
5. Open all valves and start the fluid flow. Flow sufficient fluid through the system to provide adequate measurements. When the test container has adequate volume, stop the flow of fluid.
6. Weigh and record the mass transferred into the test container.
7. Record the totalizer on the DAHS and the Micro-Motion transmitter.
8. Check for deviations, and fill out the calibration sheet.
9. Repeat steps 4 through 8 for a total of 3 runs.
10. If the average error is higher than a total of 1.0%, see the reference manual for trouble shooting procedures. Please note the field calibration errors of greater than 1.0% may not constitute an error in the meter, but human error.
11. If the error is less than a total of 1.0%, the calibration check is good.